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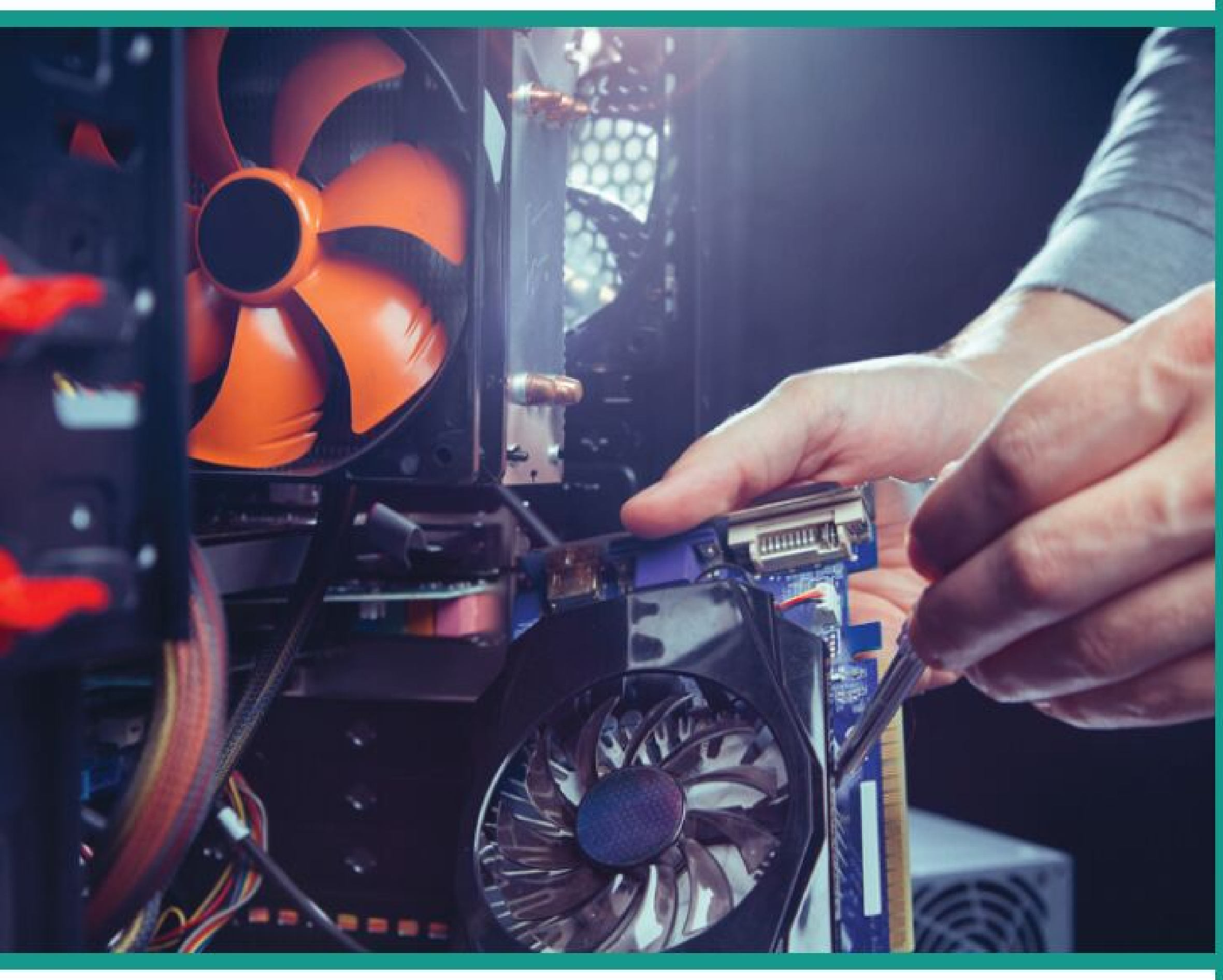

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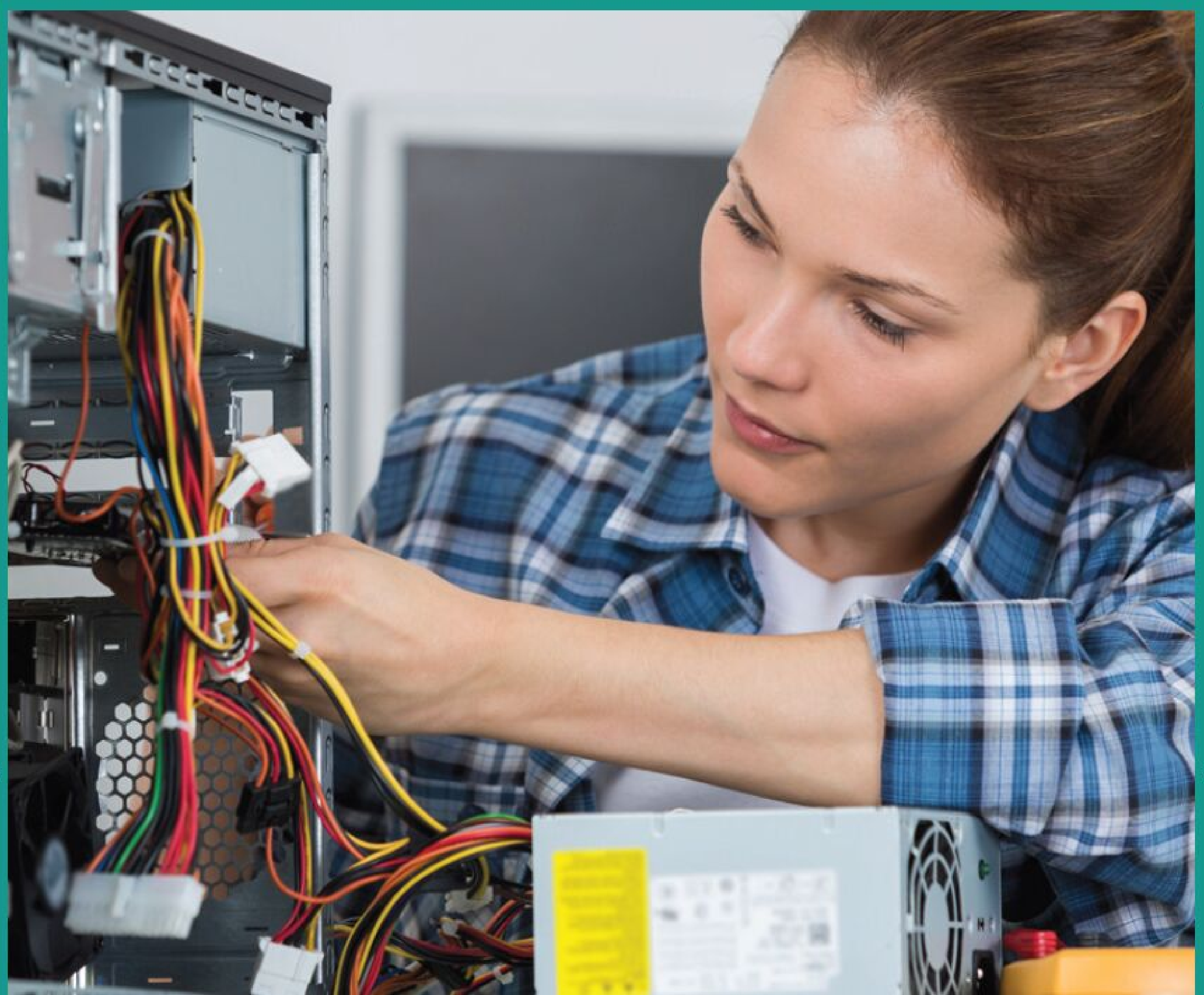

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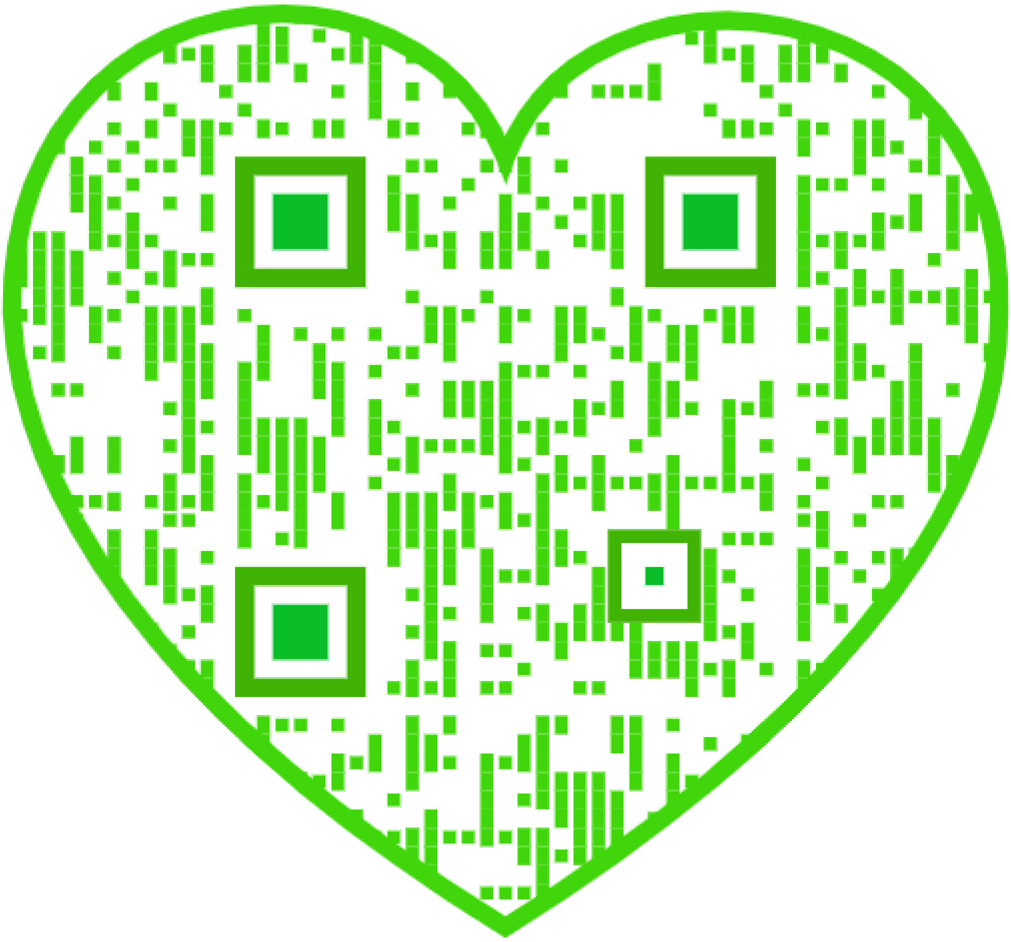

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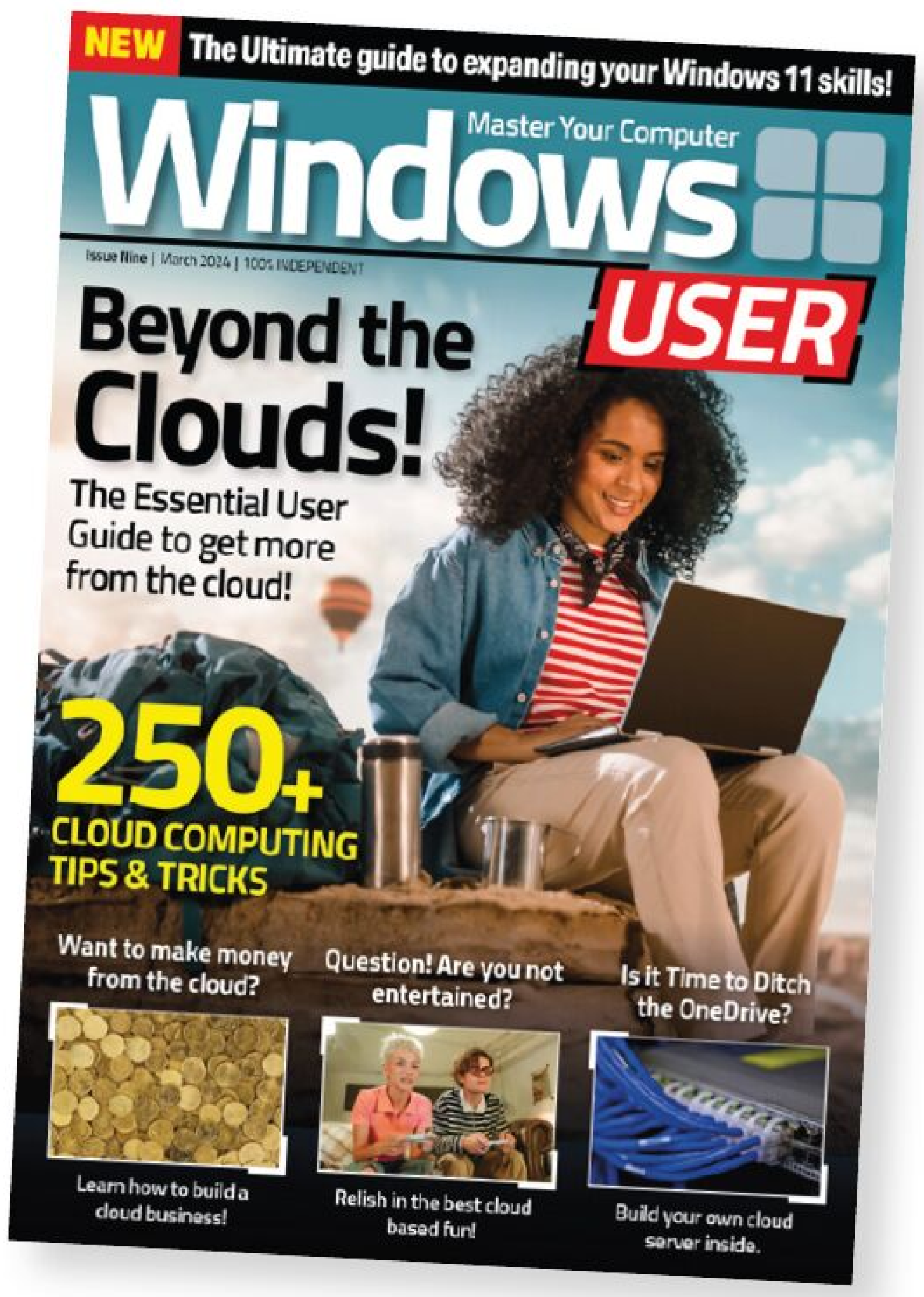
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Building Your Own PC

COMPLETE MANUAL

Your essential step-by-step guide to building your own computer from planning to completion.

Building your own PC is not something everyone will want or need to do. It takes some time, planning and careful thought and is not always the best possible way to get a new computer within your budget. However, if you want to feel a great sense of satisfaction, save money, learn more about how computers work and set yourself up to be able to solve hardware problems in the future, we recommend it to anyone. If you need to either get your first PC or replace an old one, this guide, aimed at the first time builder, takes you through every step: from planning the system to installing components and adding essential software.

Master your tech @ www.pclpublications.com

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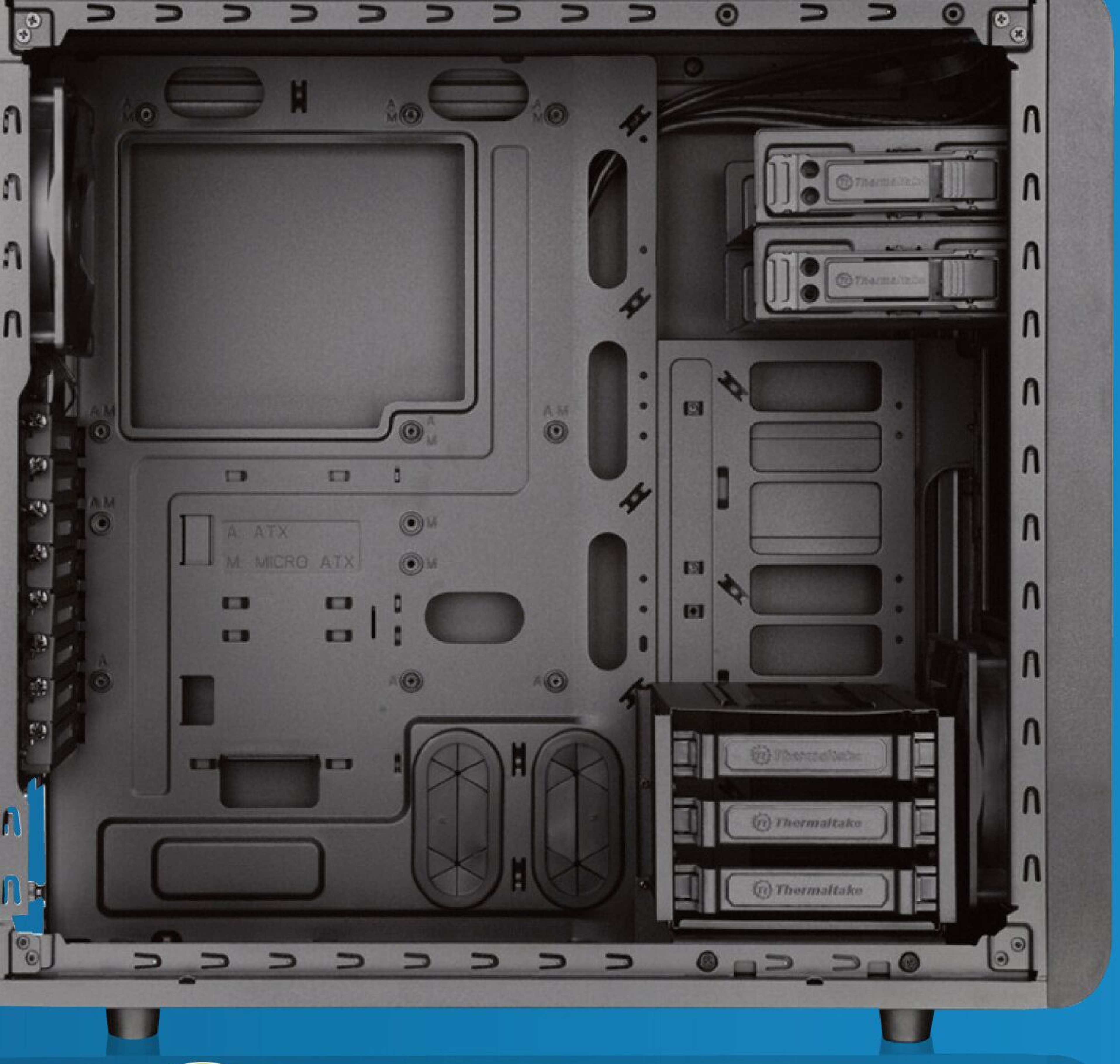

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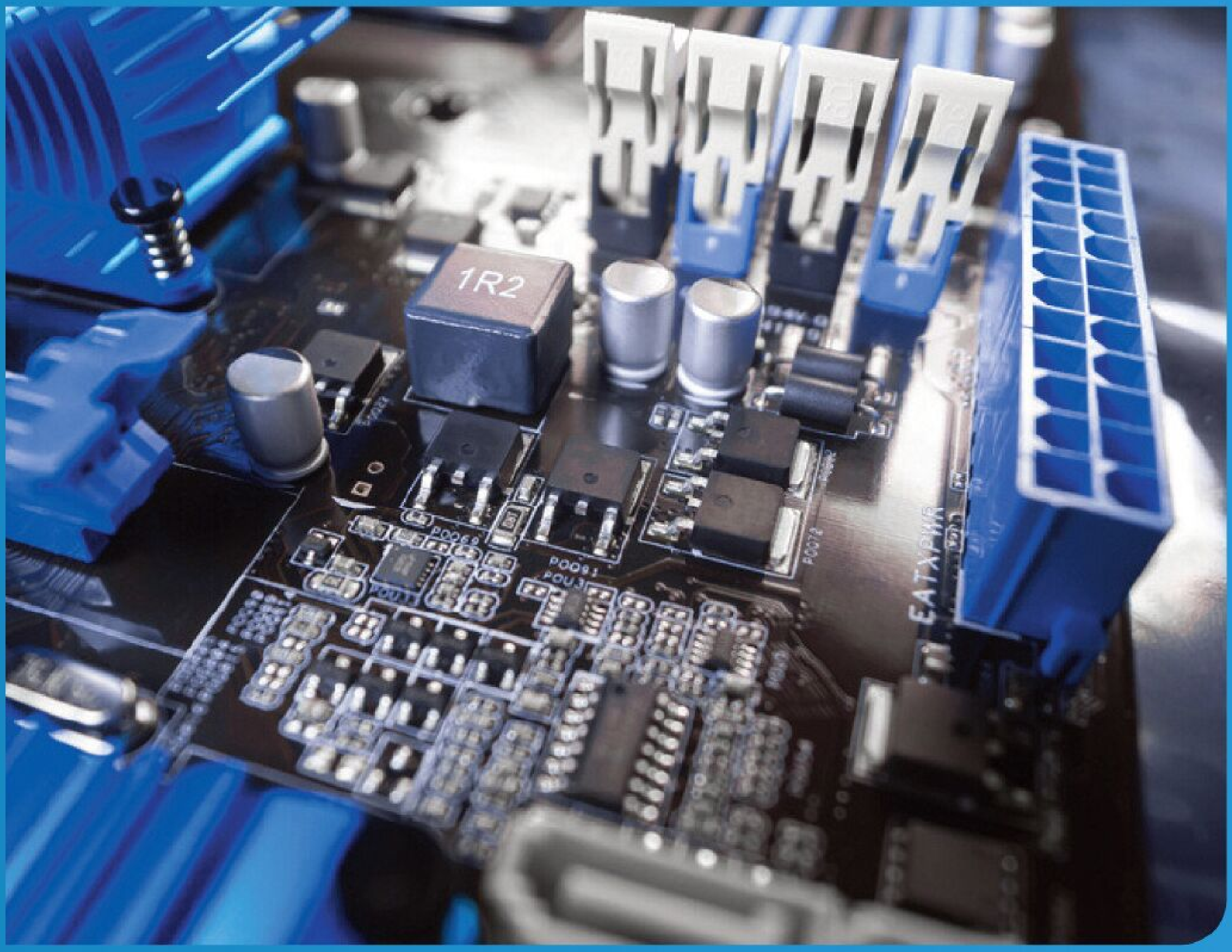

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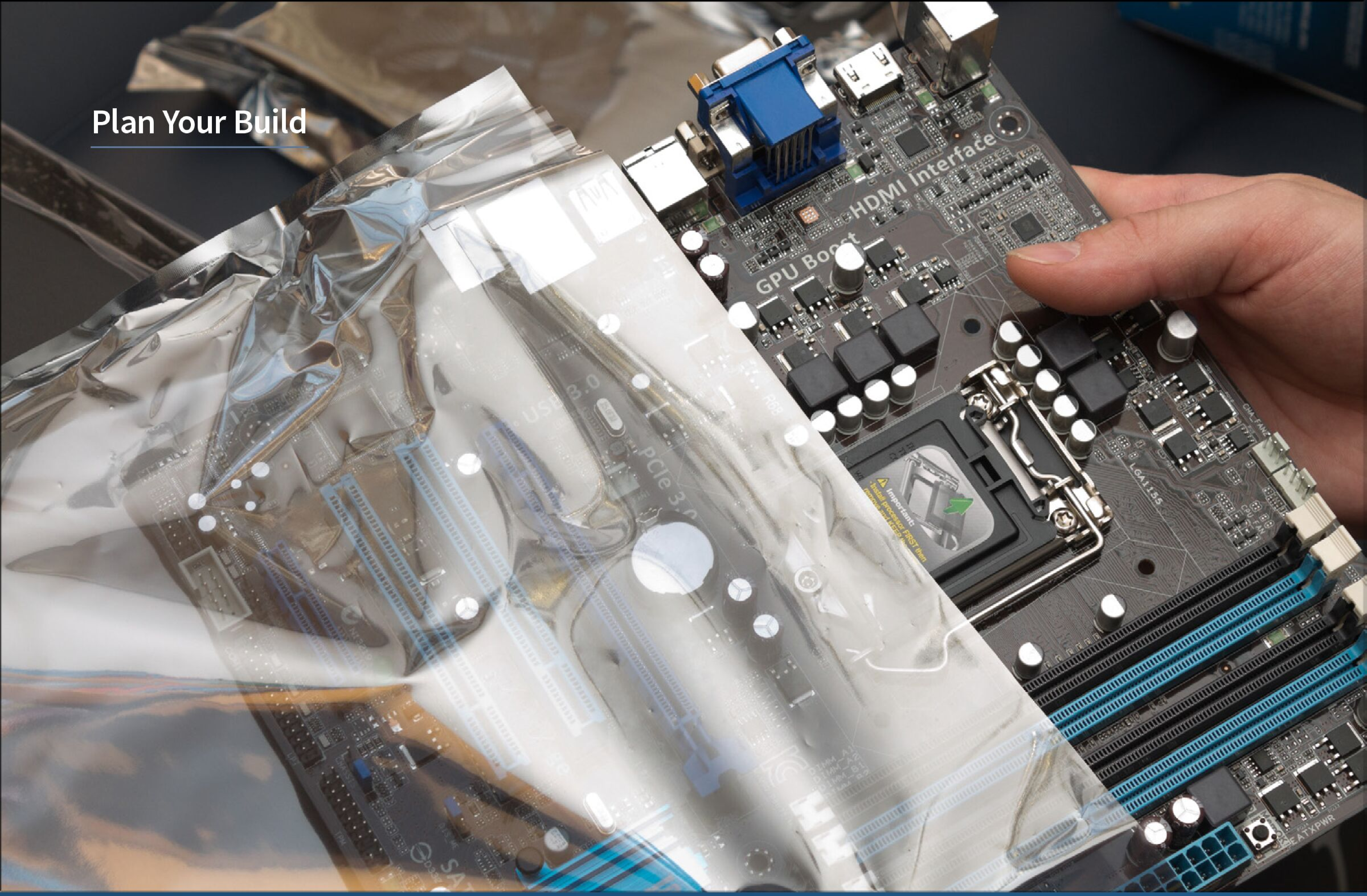

Plan Your Build

It is important before you start to build, that you make sure you have done some forward planning. Proper planning helps to ensure that you don't run into compatibility problems later, as well as allowing you to decide where you want to spend most of your budget. This section also helps you to better understand each main component of a PC build.

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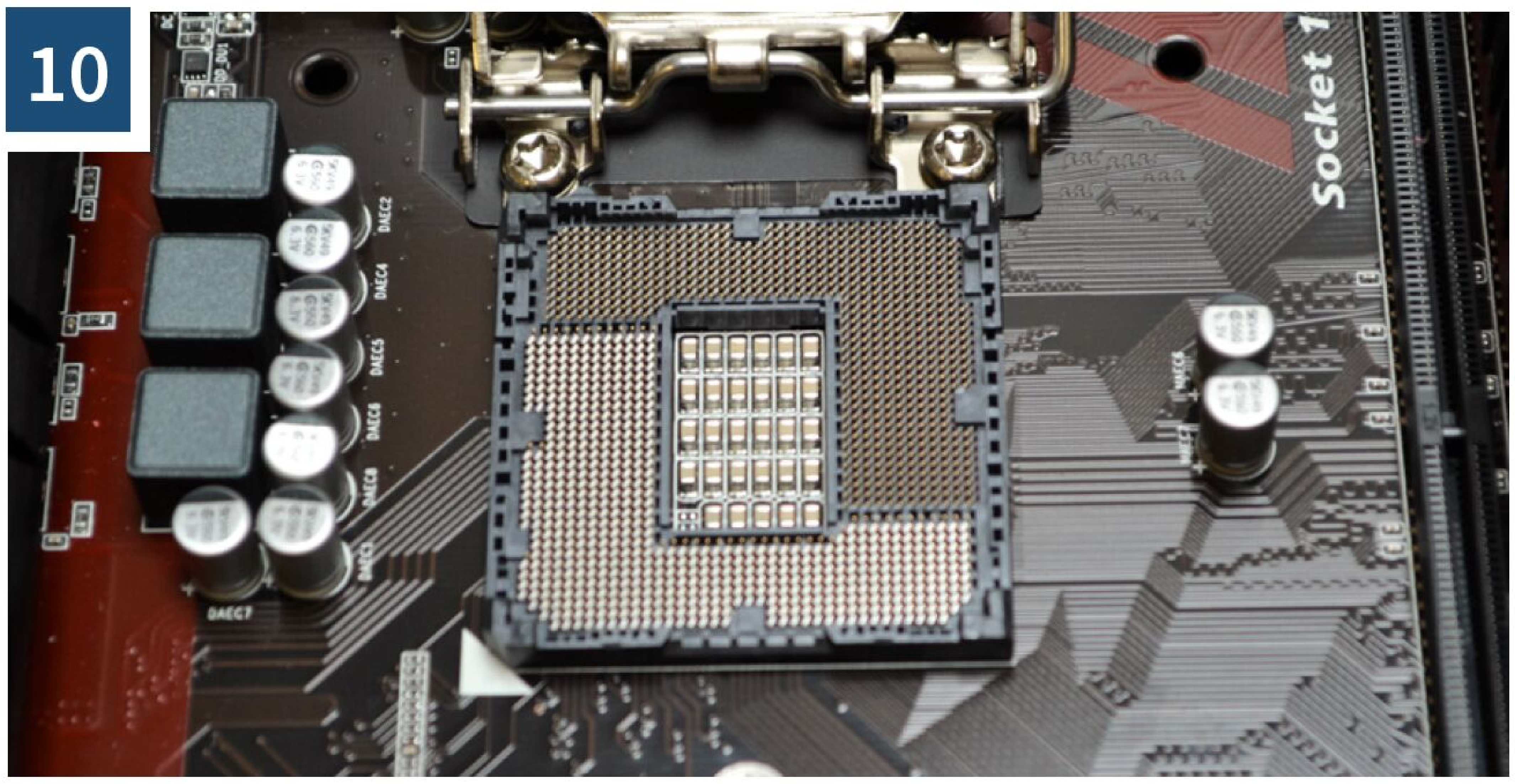

CHOOSING THE SYSTEM TYPE

Learn the main differences between the two most common Windows/Linux PC platforms; Intel and AMD. Learn the pros and cons of each type and discover reasons why you might want to choose one over the other, when you start planning your first PC build. The choice you make here will dictate several decisions later on

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CHOOSING A PC CASE

Learn what to look for in a good PC case and which features should be important to you and your computer.

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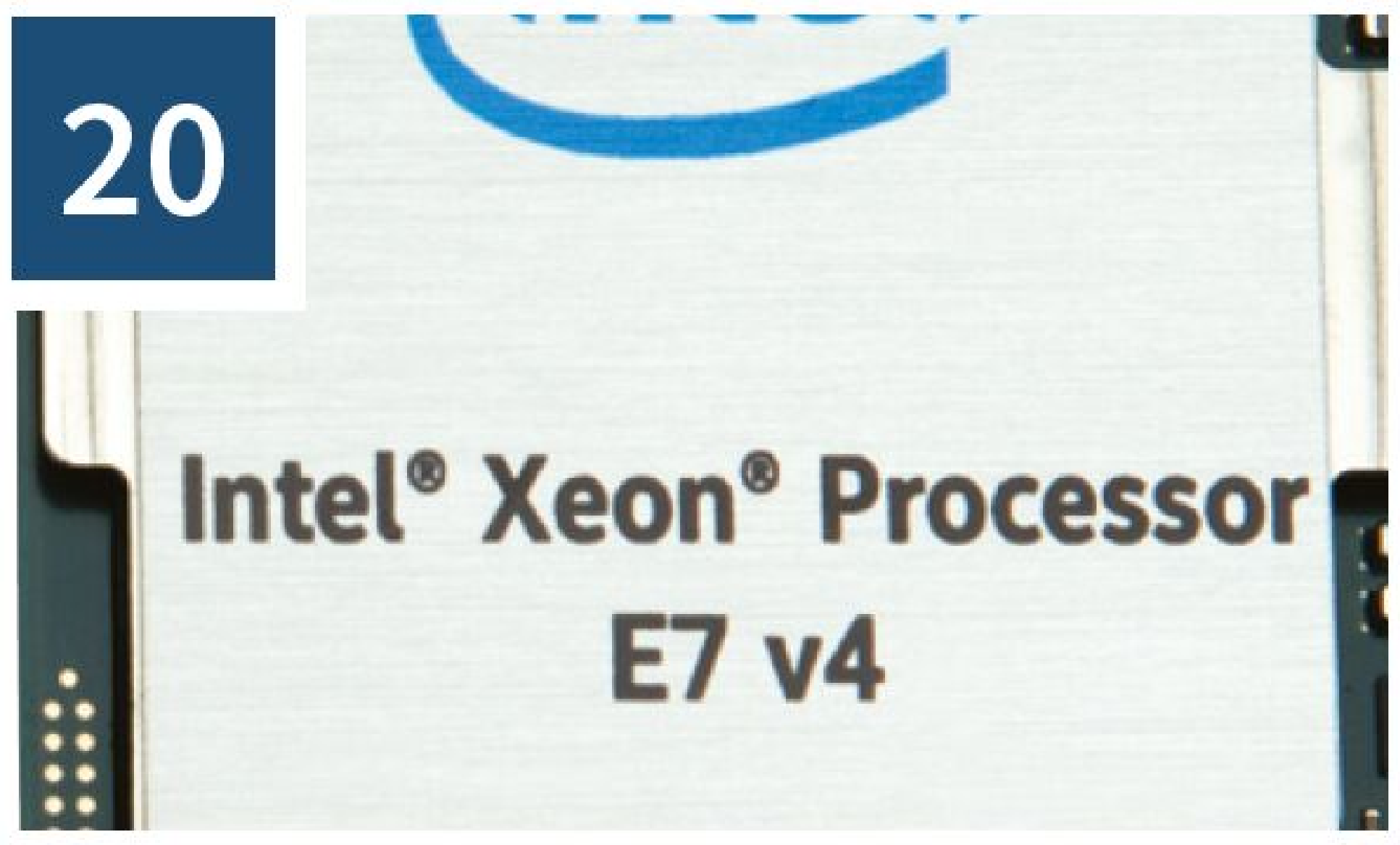

CHOOSING A PROCESSOR

Intel or AMD? There are several different categories of processor from both of these main chip makers.

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HDD, SSD OR BOTH?

The cost of storage has dropped considerably, but cost is not the only consideration when choosing a HDD or SSD.

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NEED MORE POWER?

As with any purchase, there are several things you need to consider to help you choose the right power supply.

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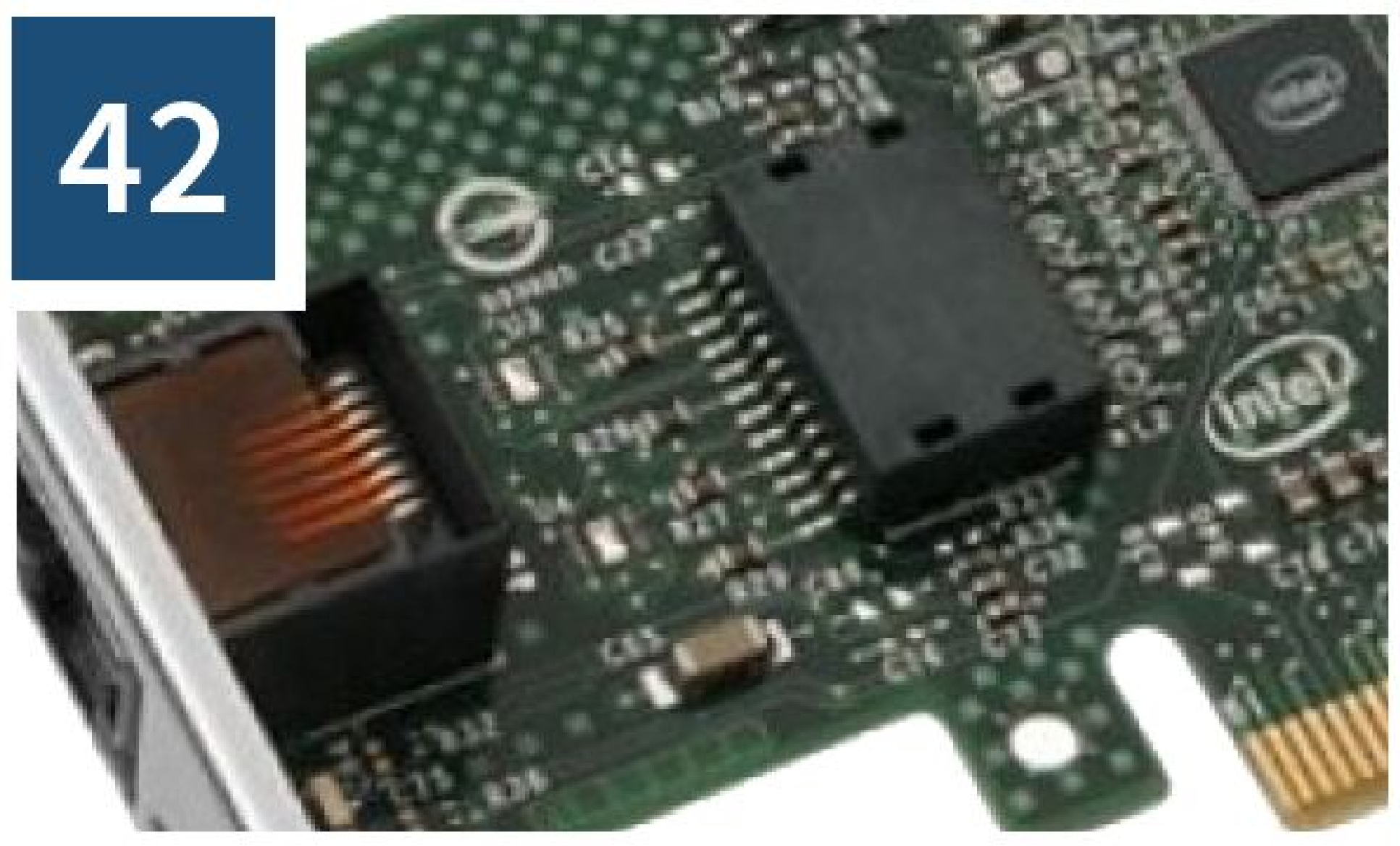

EXPANSION CARDS AND EXTRAS

You might not realise you need an expansion card, until you have understood some of the options available.

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BEFORE YOU BUILD: PRECAUTIONS

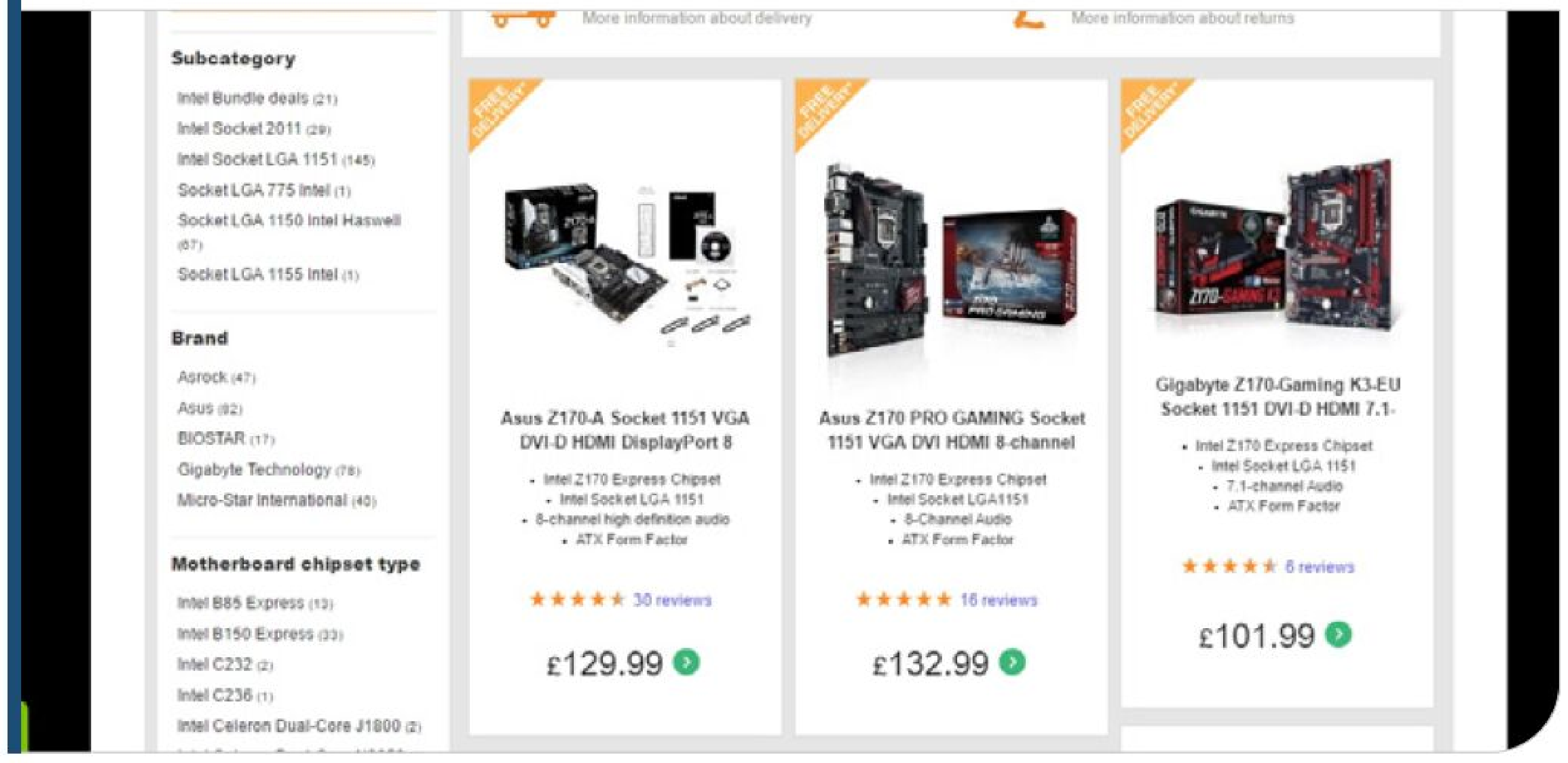
Although there is no need to be scared of a first-time build, there are some simple things you can do to prepare for it.

10 Reasons to Build Your Own PC

There are many reasons for building your own PC and if you took five different builders, all five might have a completely different reason for wanting to undertake this task. Here are our top ten reasons for choosing and enjoying to build PC after PC, in all shapes and sizes, for gaming, media and work.

1. PICK EXACTLY THE COMPONENTS YOU NEED

Shop around enough and throw enough money around and you will almost certainly be able to find a pre-built PC that matches your desired spec list. However, if you have a budget, and let's face it, many of us will have, finding an off-the-shelf PC that perfectly matches your needs is quite hard. Build your own and you can pick exactly the right parts you want, to best provide yourself with the capabilities required.


More information about delivery
More information about returns
Subcategory
Intel Bundle deals (21)
Intel Socket 2011 (29)
Intel Socket LGA 1151 (145)
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Socket LGA 1150 Intel Haswell (67)
Socket LGA 1155 Intel (1)
Brand
Asrock (47)
Asus (82)
BIOSTAR (17)
Gigabyte Technology (78)
Micro-Star International (40)
Motherboard chipset type
Intel B85 Express (13)
Intel B150 Express (33)
Intel C232 (2)
Intel C236 (1)
Intel Celeron Dual-Core J1800 (2)
FREE DELIVERY*
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Asus Z170-A Socket 1151 VGA DVI-D HDMI DisplayPort 8

- Intel Z170 Express Chipset
- Intel Socket LGA 1151
- 8-channel high definition audio
- ATX Form Factor

★★★★★ 30 reviews

£129.99

Asus Z170 PRO GAMING Socket 1151 VGA DVI HDMI 8-channel

- Intel Z170 Express Chipset
- Intel Socket LGA1151
- 8-Channel Audio
- ATX Form Factor

★★★★★ 16 reviews

£132.99

Gigabyte Z170-Gaming K3-EU Socket 1151 DVI-D HDMI 7.1-

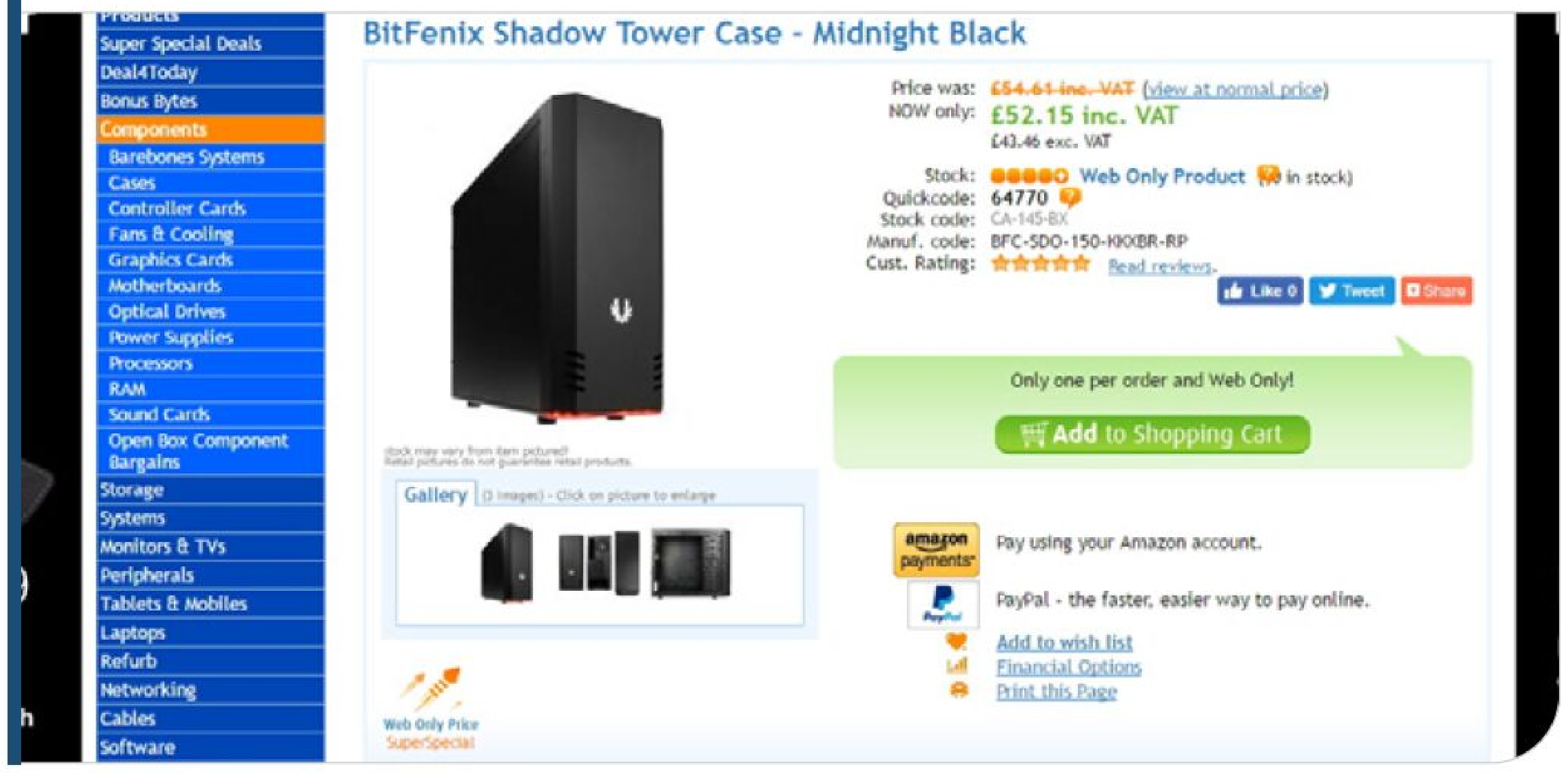
- Intel Z170 Express Chipset
- Intel Socket LGA 1151
- 7.1-channel Audio
- ATX Form Factor

★★★★★ 6 reviews

£101.99

2. TAKE ADVANTAGE OF DEALS

If you are clever and shop around, pick the right time to buy and are prepared to perhaps wait a while for something to be reduced, you can definitely get more bang for your buck by building your own PC. We saved over £50 on our chosen CPU simply because one of the component retailers that sends us newsletters had a flash (1 day) sale. We could have just saved the money but instead added it to our graphics card budget.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BitFenix Shadow Tower Case - Midnight Black

Price was: ~~£54.61 inc. VAT~~ (view at normal price)
NOW only: £52.15 inc. VAT
£43.46 exc. VAT

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Manuf. code: BFC-SDO-150-KKXBR-RP
Cust. Rating: ★★★★★ Read reviews.

Only one per order and Web Only!

Pay using your Amazon account.

PayPal - the faster, easier way to pay online.

3. THE SATISFACTION FACTOR

Nowadays, many people never really get the chance to build something for themselves but there really are few better feelings, than those you get from successfully planning and building something with your own hands. Even more so, with something as seemingly complicated as a PC. Even if you do not manage to save a huge amount of money, and massive savings aren't always possible in today's world of cheaper and cheaper pre-built systems, the satisfaction you can get certainly makes up for it.

Russ Ware
12 July at 14:31

The tidiest PC I have ever built! And also the fastest (and the one with the most light-y up-y motherboard) 🙂

4. UNDERSTANDING YOUR PC BETTER

Building your own PC is a great learning process. You will learn skills and techniques that can only help you use your PC more efficiently and confidently throughout it's usable life. While you won't suddenly be an expert PC engineer, you will certainly understand how your PC works more clearly and be in a better position to notice if things go wrong later. It also makes the task of upgrading components less daunting.

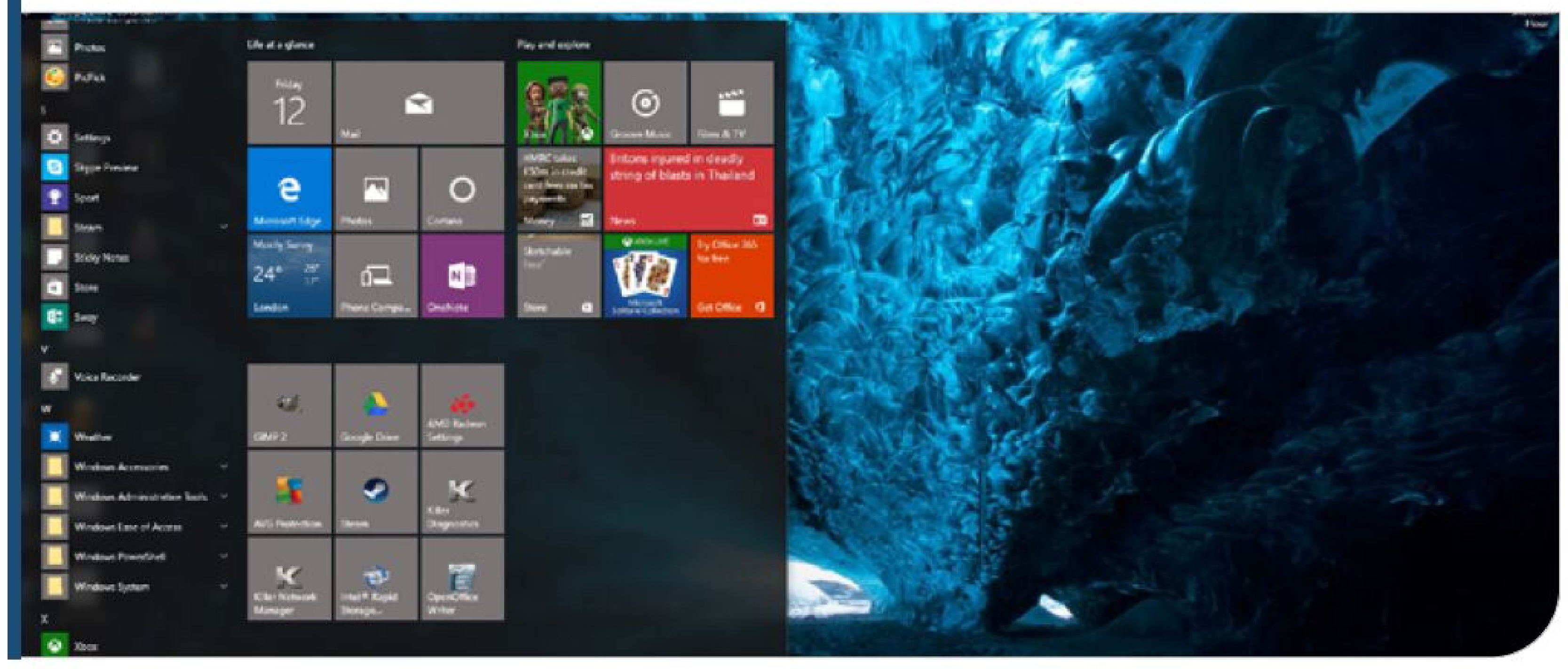
5. SPREAD THE COST

If you are prepared to commit to building your own PC, you can spread the cost without resorting to getting credit. Buy a component each month for six months and you will have almost everything you need, all the major parts anyway, without having to lay out a lump sum. You can of course, buy the parts in any order but we suggest leaving the processor, motherboard and graphics card until last. These are the ones most likely to see technology updates over that time.

GIGABYTE
ULTRA DURABLE
Z170-HD3 DDR3
Ultra Durable™ Motherboard

6. AVOID BLOATWARE

When you buy a pre-made PC, especially from one of the big chain stores, it is likely to have software preinstalled. Some of this might be useful but often it is not. You will then either have to spend time cleaning this stuff off, if you are even initially aware it is there, or live with it on your PC. When you build your own PC, you choose what goes into it!



7. PICK THE PERFECT CASE

You can buy pre-built PCs in a fairly wide range of styles, from LED-lit gaming towers to tiny media boxes. If however, you want a case that is more unusual, finding a pre-built computer is much harder. As long as you plan your build properly, you can use almost any of the thousands of different cases available, from bright orange statement towers, to camouflage painted portable LAN boxes.

8. BETTER COOLING

Even fairly cheap cases now come with cable management options and with several places to add fans. This means that you can tuck away the PSU cables so that they do not impede airflow and you can add more fans later for increased cooling too. If you buy a mid-tier case, then you will typically get 2 or 3 fans, maybe more with a high-end one. Having good airflow, a good heatsink for the CPU and a graphics card with a good cooler means that all your components will be well cooled. That means better longevity.

9. BETTER OS OPTIONS

You can utilise a slightly older OS. One thing holding a lot of people back from a new computer is the reluctance to adopt Windows 10 and previously, Windows 8. Today retailers sell the vast majority of their new hardware with Windows 8 or 10 preinstalled, whether you want it or not. Building your own machine offers the ability to load on your preferred OS: 7 if you would rather stick with the familiar, 10 if you are ready to make the jump or GNU/Linux if you really want something different.

ubuntu

10. SELF-BUILDING IS FUN!

Owning a self-built PC is great fun. The process is full of packages arriving, opening packages, putting things together and learning what goes where and why and how. Discovering a new trick for routing cables better or learning about a faster type of transfer cable becomes exciting! You will love your new rig more than you could ever love one from a store because it takes you beyond mere hardware ownership and bestows hardware familiarity.

INTEGRATOR 700W

Choosing the System Type

For most people who want to build their own PC, there are only two real choices when it comes to the system type, Intel or AMD. There are advantages to choosing either one of these options, which might not be immediately obvious to the very new builder. It might also not be obvious that compatibility problems can occur if you don't understand the difference between these two PC platforms. Your choice here will definitely influence every major component purchase you make later.

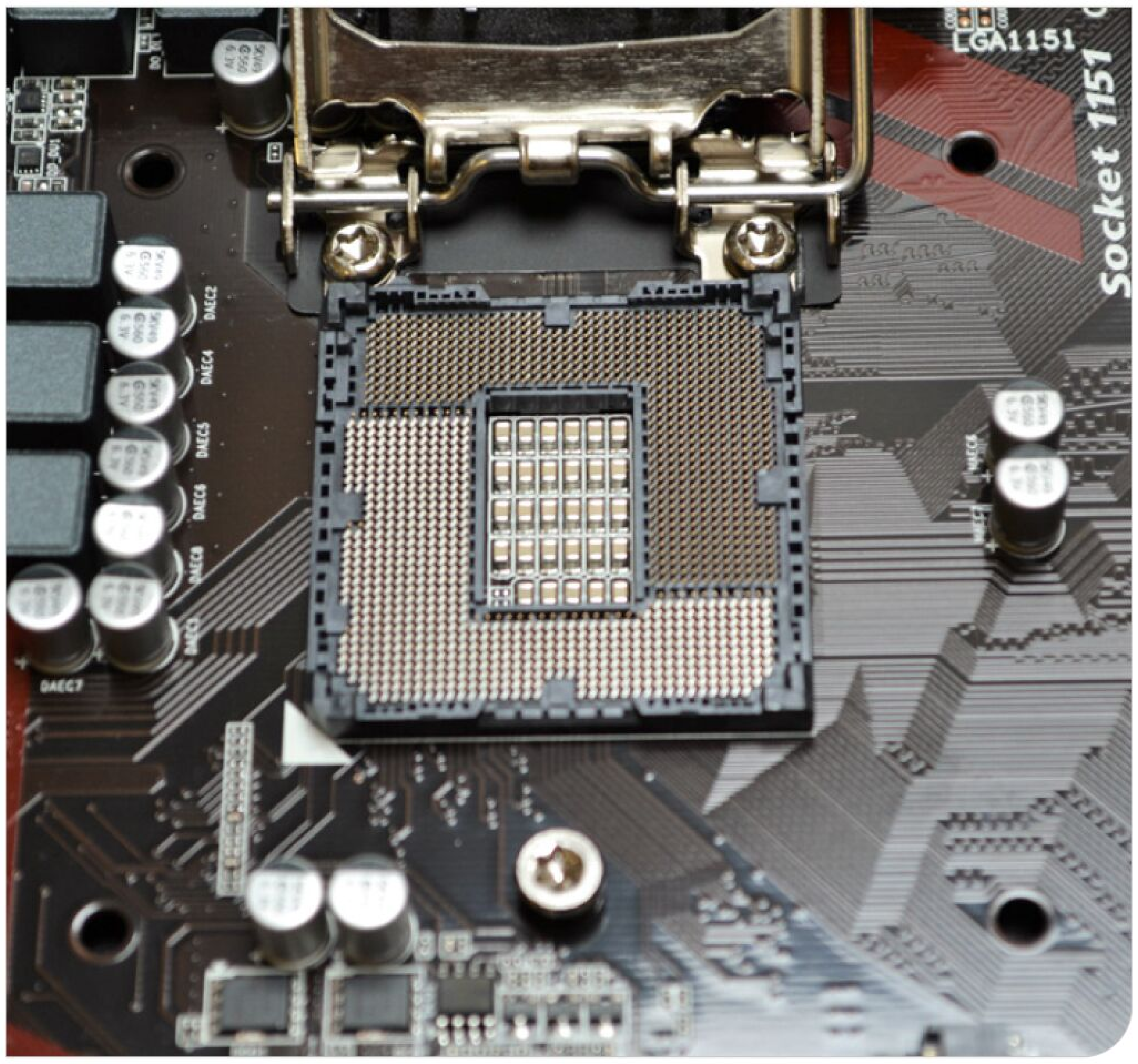
Why Choose Intel?

intel
Intel® Xeon® Processor
E7 v4

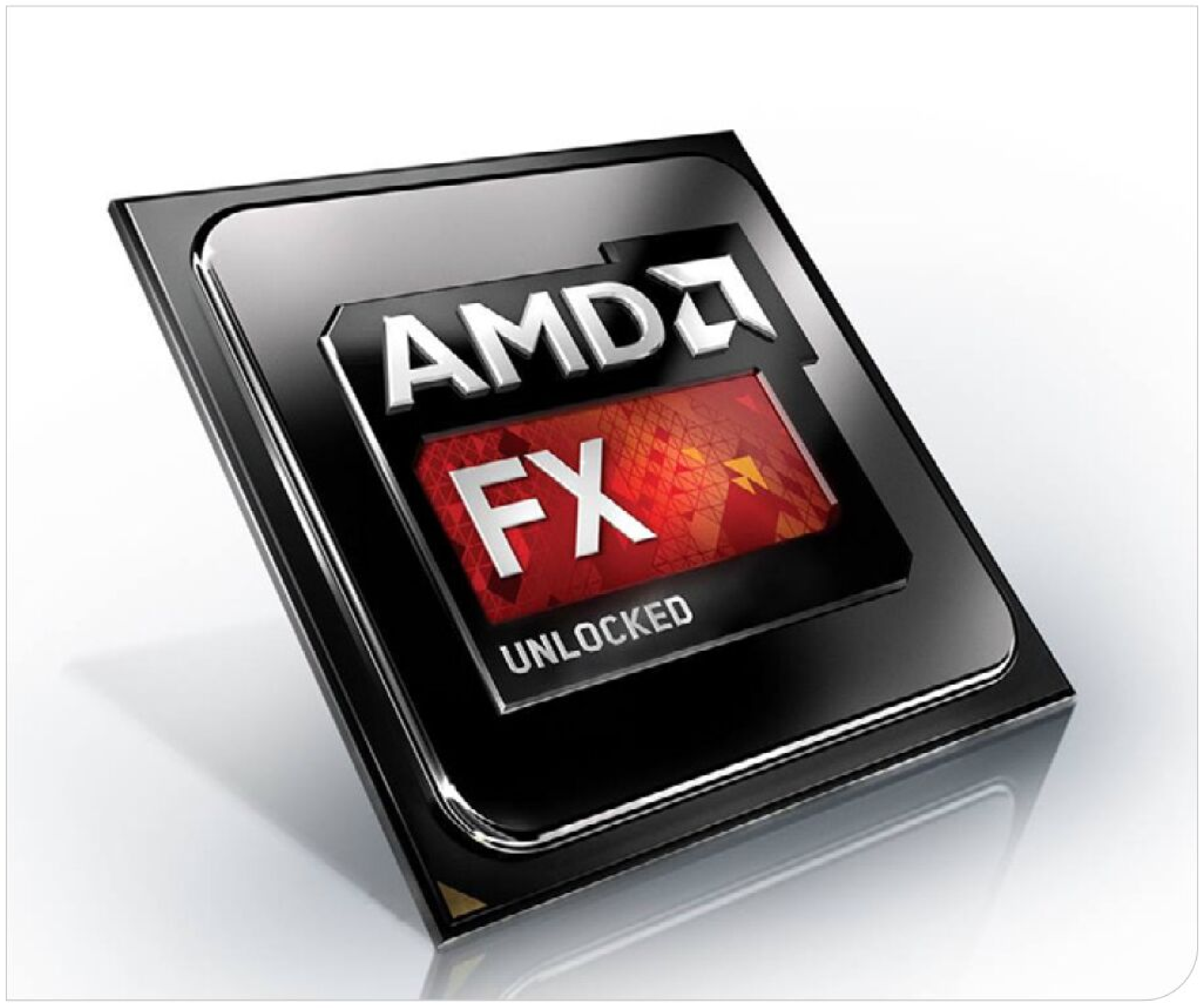
Intel is probably the better known PC platform and almost certainly has a larger following amongst PC builders around the globe. This is largely because they lead the world in processor development, offer a wider range of chips and are better supported by other component manufacturers. Although Intel's advances in CPU technology has slowed in recent years, they are still constantly improving and refining their chips.

If you are building a gaming or multimedia PC, Intel is probably the better choice and not only because their processors generally offer better speed and power, along with good overclocking properties on the K-series processors, for the money. The choice of CPU dictates the choice of motherboard (or vice versa) and some of the best gaming motherboards are made for Intel chips, so it makes sense to go down this route.

Trying to keep up with the latest developments from Intel is expensive, as you will always pay a premium for the latest chip and will also then need to make sure that you choose a motherboard with a compatible socket. However, advances in chip design also means that predecessor chips become more affordable and give you opportunities to find a powerful bargain.



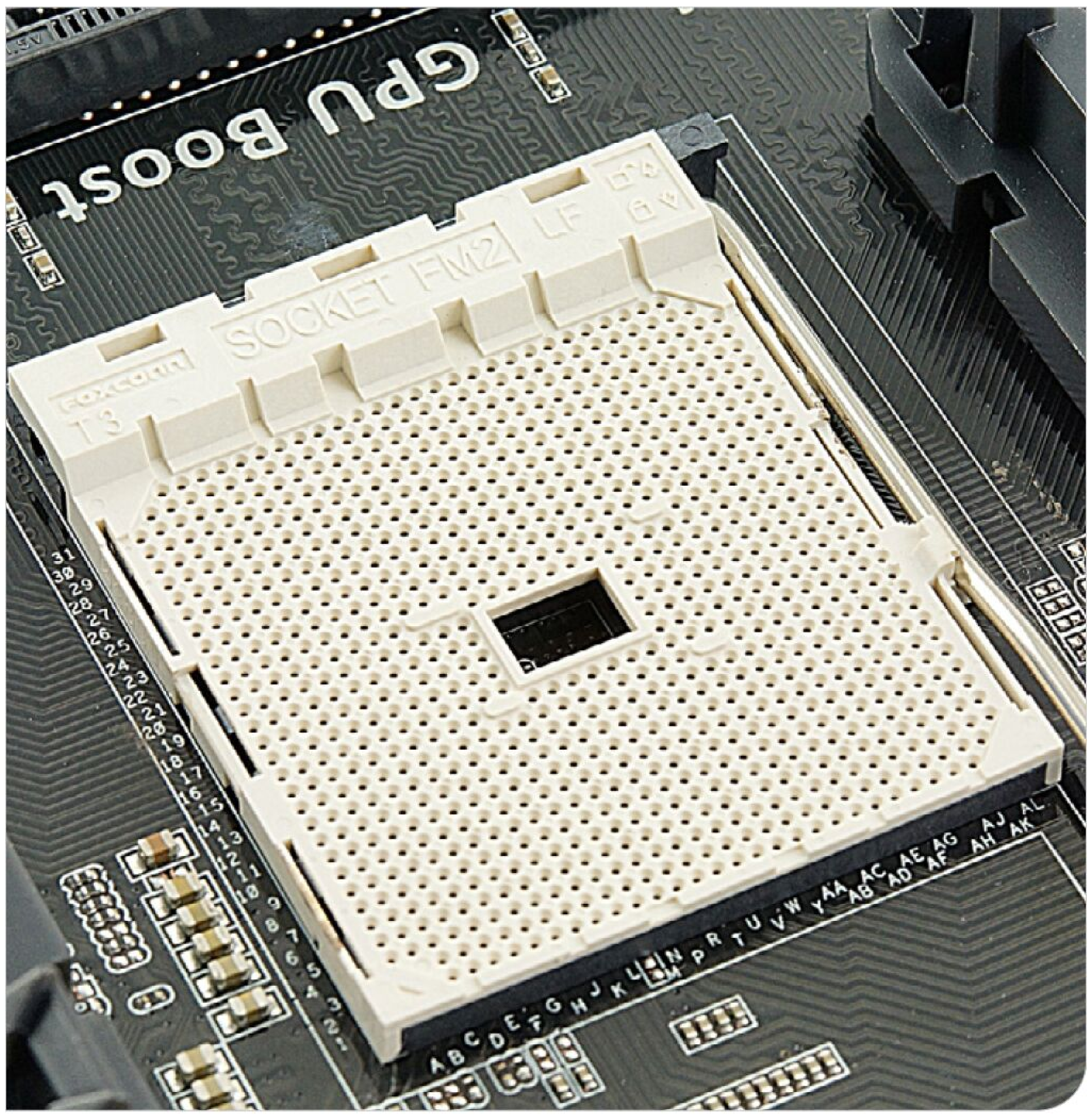
Why Choose AMD?



If you are building on a budget, or if you are not worried about your PC being able to handle more taxing processing actions such as gaming or video editing, AMD could be for you. Not only are AMD processors and motherboards usually cheaper than Intel, they also give you the option to combine the CPU and a GPU in a single unit: the APU.

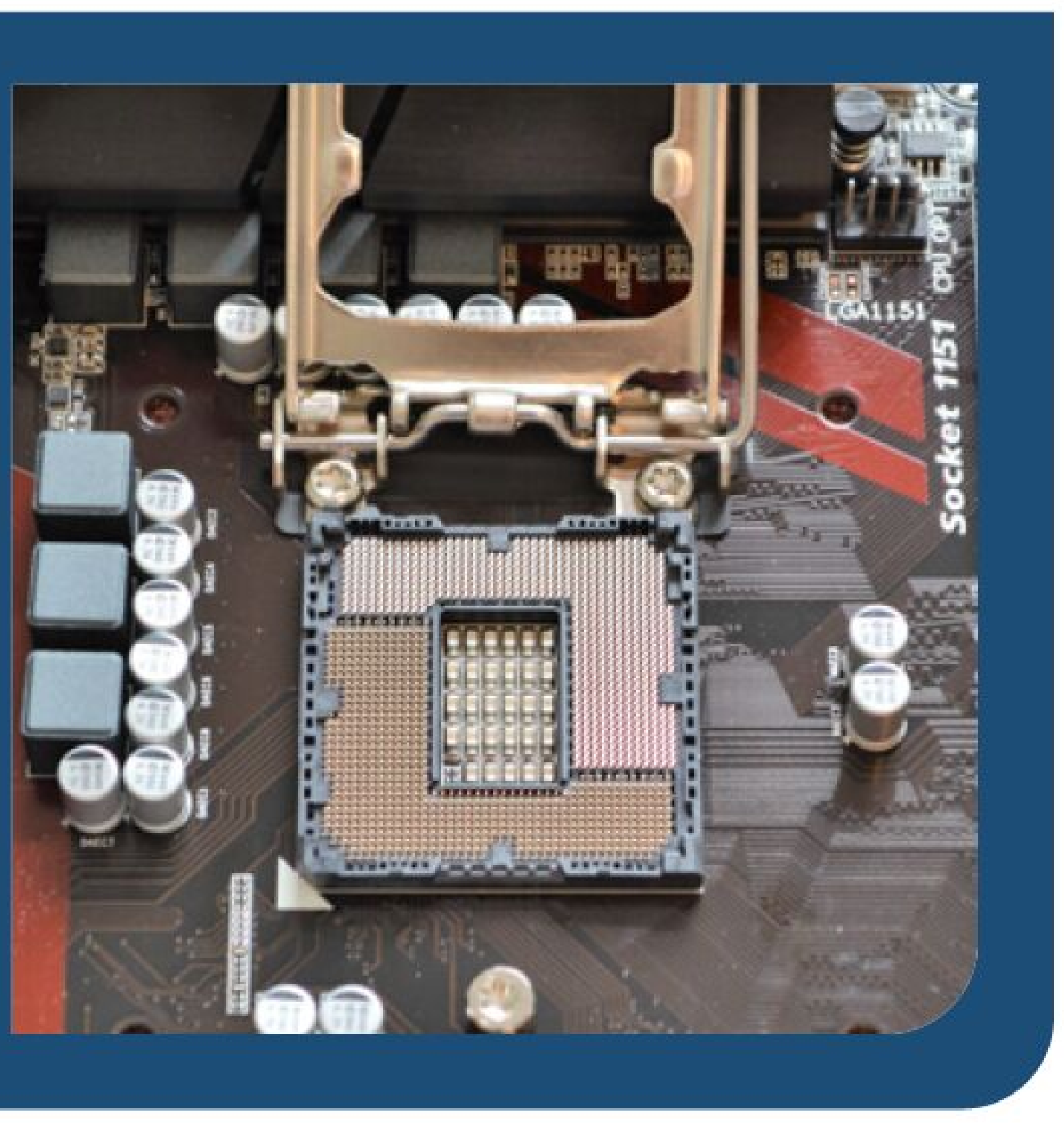
That isn't to say that AMD processors are completely unsuitable for gaming rigs, because some of the higher-end Ryzen CPUs now offer similar performance to Intel i5, i7 or even i9, but if you are going for pure power, AMD may not be the best choice. There is also a smaller choice with AMD and some of the processor architecture still available to buy is getting near to the end of its effective life.

The latest AMD gaming processors, in the AM4 Ryzen family, include something for everyone and every budget. Ryzen 3 are the cheapest and lowest-powered, followed by the Ryzen 5 and Ryzen 7. All include X versions (e.g. 2700X) which allow for overclocking. The Ryzen family also includes a high-end version called the Threadripper, which uses a different socket (TR4) to allow up to a huge 32 cores and 64 threads. AMD also recently launched the EPYC range of CPU's, although these are aimed more at servers and other HPC workloads.



PC COMPONENT COMPATIBILITY

Whichever platform you choose, and both can result in a great first PC, you need to make sure that you understand the difference between them when buying components. An Intel processor will need a motherboard with an Intel socket and the correct Intel socket for that processor, such as LGA 1155 or 2011. An AMD processor will need a motherboard with an AMD socket, such as AM3+ or FM2. You also need to be aware that the newer and more expensive the CPU and motherboard, the more features they will have. Cheaper boards, suitable for older processors, might not offer everything you need. Be aware of compatibility at every step of your planning, buying and building process and if you are unsure, check forums or contact the retailer to ensure each part will work well with the others.



Choosing a PC Case

Although they may not have seen the sort of massive changes that most other PC components have, the choice of case for your build is now much wider than it was just a few years ago. From simple black boxes, to LED-lit windowed showcases, there is a case style out there for everyone. However, choosing a case should be about more than just looks. Quality and features vary greatly and getting this key component right can mean the difference between a good and a great first build.

Thermaltake

START BUILDING

Case: Thermaltake Core V31
Build: Turn to page 56 to start preparing your PC case

Making Your Choice

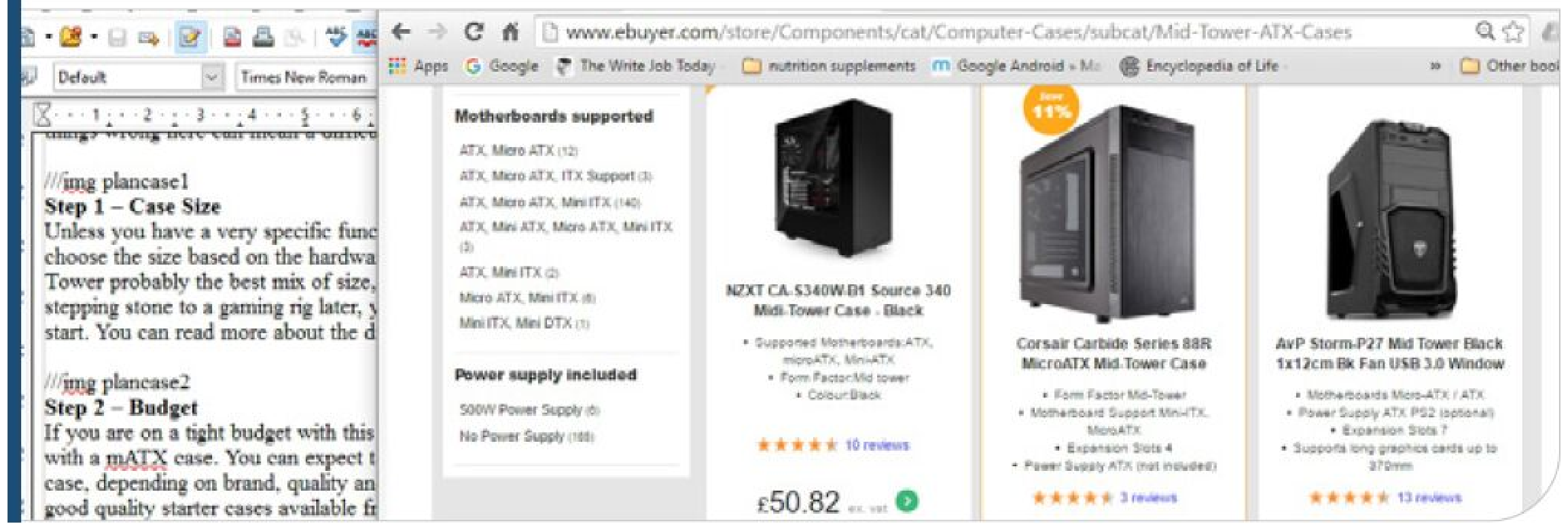
As with any purchase, there are several things you need to consider before you choose a case. Getting things wrong here could mean a difficult build or additional expense later.

CASE SIZE

Unless you have a very specific function planned for your PC, media Box or portable, it is best to choose the size based on the hardware you want to fit inside. For most first time builders, a mid size tower is probably the best mix of size, budget and range of styles available. If your initial build is a stepping stone to a gaming rig, you might want to think about getting an E-ATX case from the start. You can read more about the different case sizes available on the next page.

BUDGET

If you are on a tight budget with this build, you are probably going to get better value for money with a mATX case. You can expect to pay anything from £25 to £300 ($30 to $350) for a mATX case, depending on brand, quality and features. You really don't need to spend a fortune, as really good quality starter cases are available from around £40 ($45). You can expect to pay closer to £100 ($115) for a half decent E-ATX case and double that for a high-spec one. Our advice is to go for a cheaper big name case: Thermaltake, Coolermaster, Corsair, Antec etc. rather than a flashy one from a lesser-known brand.



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Step 1 – Case Size
Unless you have a very specific func
choose the size based on the hardwa
Tower probably the best mix of size,
stepping stone to a gaming rig later, y
start. You can read more about the d

///img plancase2
Step 2 – Budget
If you are on a tight budget with this
with a mATX case. You can expect t
case, depending on brand, quality an
good quality starter cases available fr

Motherboards supported
ATX, Micro ATX (12)
ATX, Micro ATX, ITX Support (3)
ATX, Micro ATX, Mini ITX (140)
ATX, Mini ATX, Micro ATX, Mini ITX (3)
ATX, Mini ITX (2)
Micro ATX, Mini ITX (8)
Mini ITX, Mini DTX (1)

Power supply included
500W Power Supply (6)
No Power Supply (188)

NZXT CA-S340W-B1 Source 340 Midi-Tower Case - Black
- Supported Motherboards:ATX, microATX, Mini-ATX
- Form Factor:Mid tower
- Colour:Black

★★★★★ 10 reviews
£50.82 ex. vat

Corsair Carbide Series 88R MicroATX Mid-Tower Case
- Form Factor Mid-Tower
- Motherboard Support Mini-ITX, MicroATX
- Expansion Slots 4
- Power Supply ATX (not included)

★★★★★ 3 reviews

AvP Storm-P27 Mid Tower Black 1x12cm Bk Fan USB 3.0 Window
- Motherboards Micro-ATX / ATX
- Power Supply ATX PS2 (optional)
- Expansion Slots 7
- Supports long graphics cards up to 370mm

★★★★★ 13 reviews

STYLE

This is very much a personal choice. Some builders will like the windowed, vented and LED-lit gamer-style cases; others will prefer the understated black box style. There are cases in almost every style imaginable but just make sure that you don't choose style over substance. If a case is cheap but seems to have a lot of external design elements, it could well be that the quality on the inside is lacking. Our Thermaltake Core V31 is a nice mix of understated and modern gamer, with a window to show off the inside, a sleek mesh front and great build quality and all for just £40 ($45).

FEATURES

Although this should probably be higher up the list, we have found that it usually isn't. It is very easy to find two very similarly priced and externally styled cases that differ hugely in the more technical features they provide. A good case should, in our opinion, include at least two 120mm or 140mm fans, a usable front panel with USB, audio etc. and should be made mainly of metal. Be careful that the metal isn't wafer thin though. It should ideally be toolless and have removable drive bays too.

CASE AND PSU

As you browse the online stores for a PC case that suits your needs and wants, you will likely see cases that come with a PSU. These can seem like good value but our advice is to be wary. Cases that are bundled with a power supply usually fall more into the budget category, as does the power supply that is thrown in. You can shave your budget slightly by buying like this but just be cautious and check the spec of each before you buy.

PC Case Sizes

There are several different case sizes available, from Mini ITX to full tower. Styles and sizes vary within these form factors but certain rules always apply.

FULL TOWER (E-ATX)

Full tower, or Extended ATX, cases are generally larger than the standard ATX cases and almost always the most expensive off-the-shelf cases you can buy. E-ATX cases are mostly designed to be gaming or server cases, with lots of room inside for massive graphics cards (some high end GFX cards are up to 30cm long), water cooling radiators and case fans. Full tower cases usually have more expansion slots at the back, at least two, and up to four, front fans and a side panel window. These large cases are normally only suitable for E-ATX and ATX motherboards.

MICRO ATX

Micro ATX, which are often labelled as mATX or cube cases, are perfect for those with a lack of space and who don't need to fit high end GFX cards, water cooling, etc. Just as with any other type of case, mATX cases are available in a range of styles and at a range of prices. Smaller doesn't need to mean cheaper and less innovative. Building a PC with a mATX case takes a bit more planning than the previous two sizes we have discussed. Most graphics cards that will fit in an ATX or E-ATX case, without you having to think about it, won't fit in many mATX cases. The same applies to large CPU coolers.

MIDI TOWER (ATX)

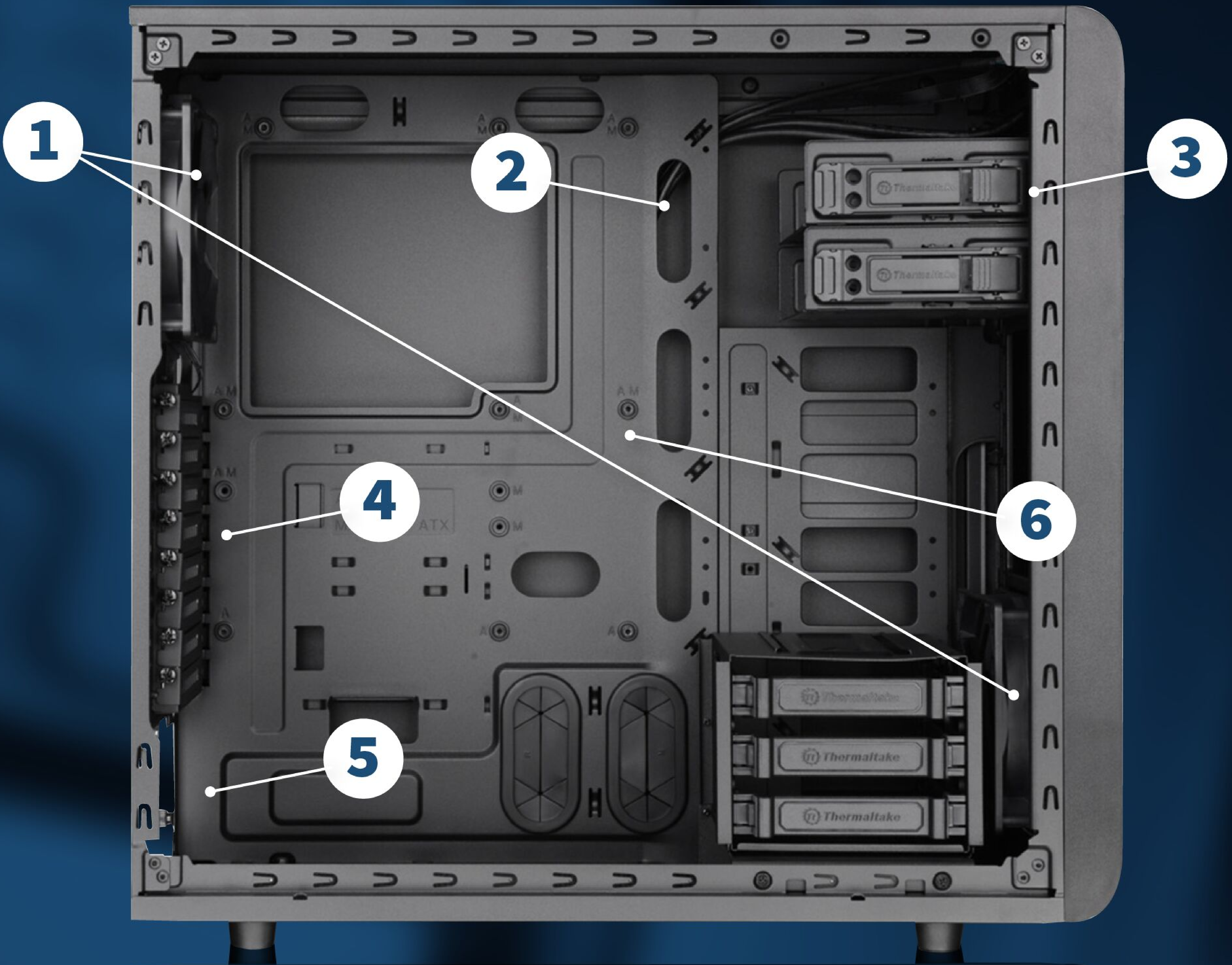
Midi tower or mid tower were originally known simply as tower or ATX cases but since the arrival of E-ATX, the more descriptive name is used to show that they are between full and mini towers. Mid tower cases are where you will find the most choice, and probably the best value for money. You can spend a little or a lot and as long as you choose carefully, still get a case perfect for your build. ATX cases will usually accept ATX, Mini ATX and Micro ATX motherboards but it is worth double-checking before purchase. Our case is a midi tower.

MINI ITX

The smallest of the four main case form factors, ITX or Mini ITX are most often cubes but you can also find some that are like mini tower cases. These allow for very compact builds, for media PCs and often include features that allow them to be moved around easily with carrying handles, etc. You will have to use a special ITX motherboard with this type of case but you should be able to fit a mid-size graphics card into many of them. The ITX form factor is a fairly recent addition to the PC case ranges and because they are quite specialist, your choice of styles will be slightly more limited than with more common sizes.

Inside Your Case

Here we take a look inside the Thermaltake Core V31 case that we are using in our build and check out some of the features that made us choose it.



1 PREINSTALLED FAN

The Core V31 comes with two fans installed, one at the front and one at the back, both of which are important for airflow. There are mounting holes for two more.

2 CUT OUTS FOR CABLES OR PIPES

As you can see, the back (or side) panel of our case is full of cut outs, ideal for managing all of the power cables or water cooling pipes we could possibly need.

3 TOOLLESS DRIVE TRAYS

The optical drive tray at the top and the HDD tray at the bottom are both toolless designs, so no screws to undo. Both of these trays can also be moved or removed as required.

4 EXPANSION SLOTS

The case provides the standard eight expansion slots that ATX cases usually have. These, like all other parts of the case, are toolless and held in place by thumb screws.

5 VENTED PSU MOUNT

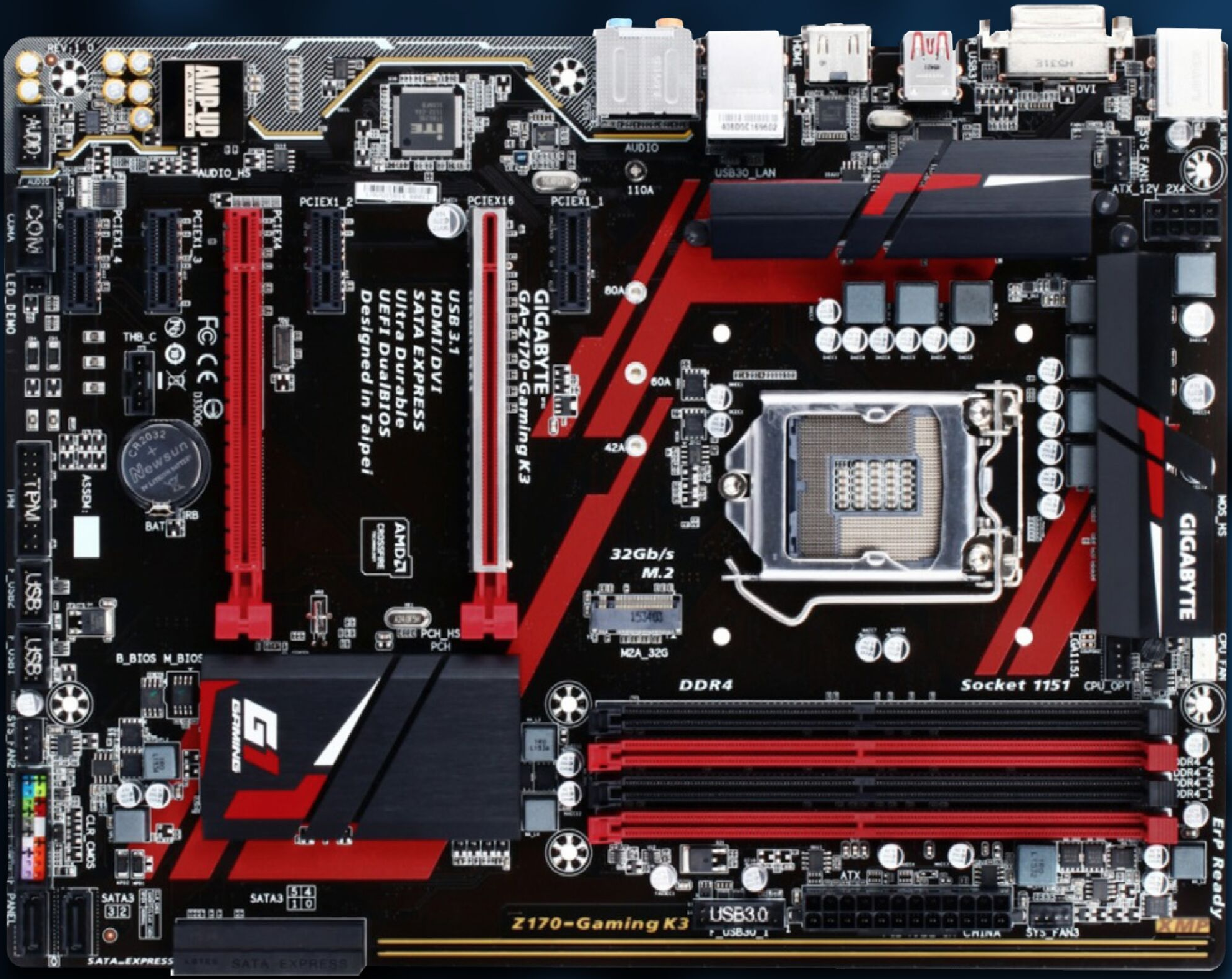
This case positions the power supply at the bottom; some cases put this at the top. What you can't see in this image are the air intake vent and rubber anti-vibration mounts.

6 ATX AND MATX

As you can see this case provides mounting for two sizes of motherboard, ATX and Micro ATX, simply by moving the risers to the required positions.

Motherboards

It might seem that your choice of motherboard is fairly straightforward; Intel or AMD compatible, depending on the CPU you are going to use. However, if you want to get the best out of your new PC, you really need to choose a motherboard based on your main usage aims. A gaming motherboard will offer very different features to one designed for general use or office work. Over the next few pages we will look at the many different motherboard options available to you.



START BUILDING

Motherboard: Gigabyte Z170-Gaming K3 (Intel, ATX)
Build: Turn to page 68 to start installing your motherboard

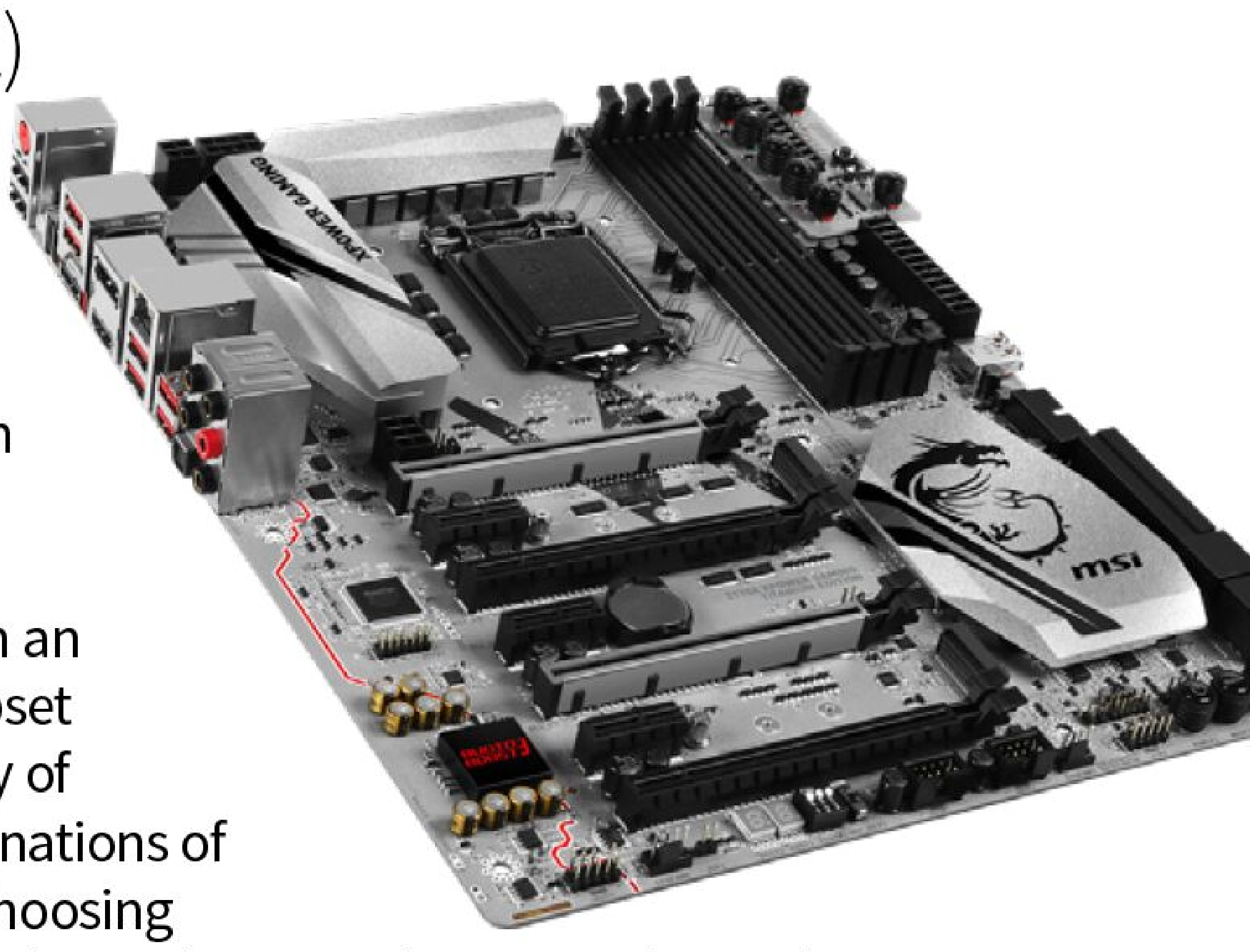
Choosing a Motherboard

The motherboard (or mainboard) in your PC is the foundation of everything else you plan to add, so it makes sense to ensure you choose the best one possible.

INTEL OR AMD

Your only real choice of processor is going to be between Intel and AMD and so your choice of motherboard is going to be based initially, on which processor type you have decided to go with. Intel are the market leaders, with the fastest and most powerful processors among their range. However, AMD make some very good processors and they tend to be considerably cheaper; so if you are on a very tight budget, this could be an option. Once you have decided which to use, your search for a motherboard can be narrowed down slightly.

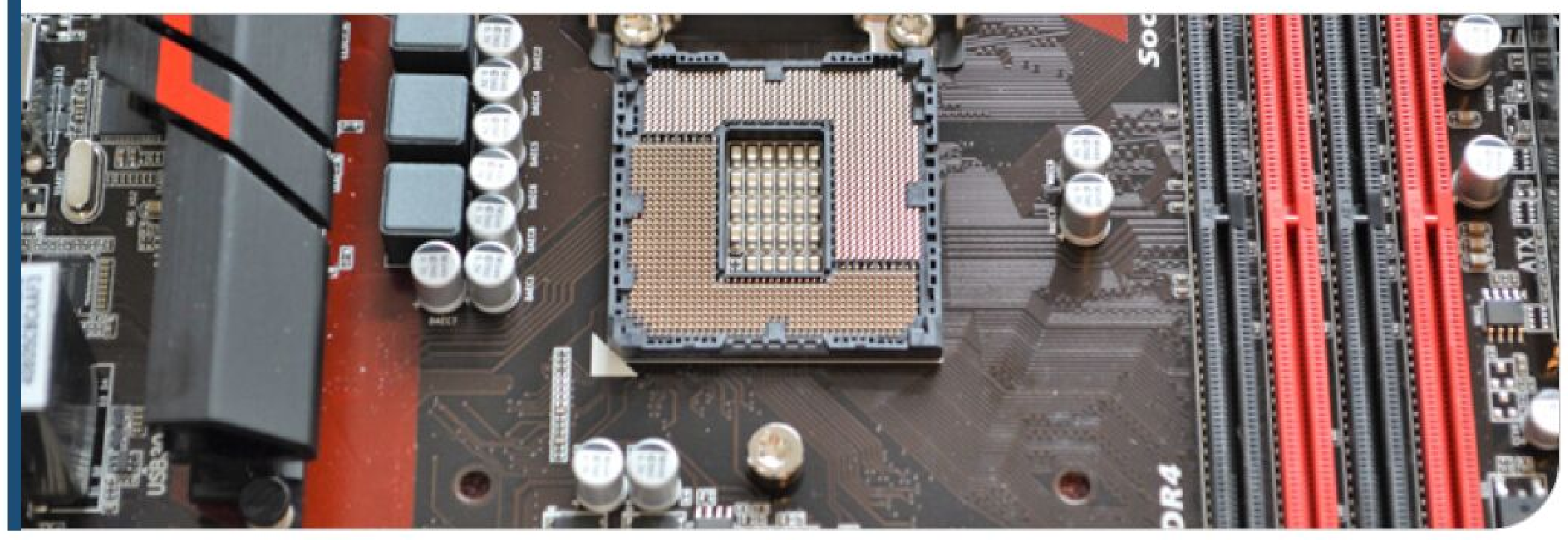
CHIPSET (INTEL)



Assuming you have chosen to build with an Intel CPU, the next step to narrowing down your motherboard search is to choose a chipset. A chipset is simply a set of electronic components in an integrated circuit, so chipset types are really just a way of denoting different combinations of motherboard features. Choosing between them is usually about what you plan to use the PC for mainly. Gaming chipsets like Z170 and Z97 Express tend to allow overclocking and multiple graphics cards. H chipsets (H97, H110, etc.) are usually more mainstream, losing the overclocking feature for example. Q and B chipsets are aimed more at business or non-media builds.

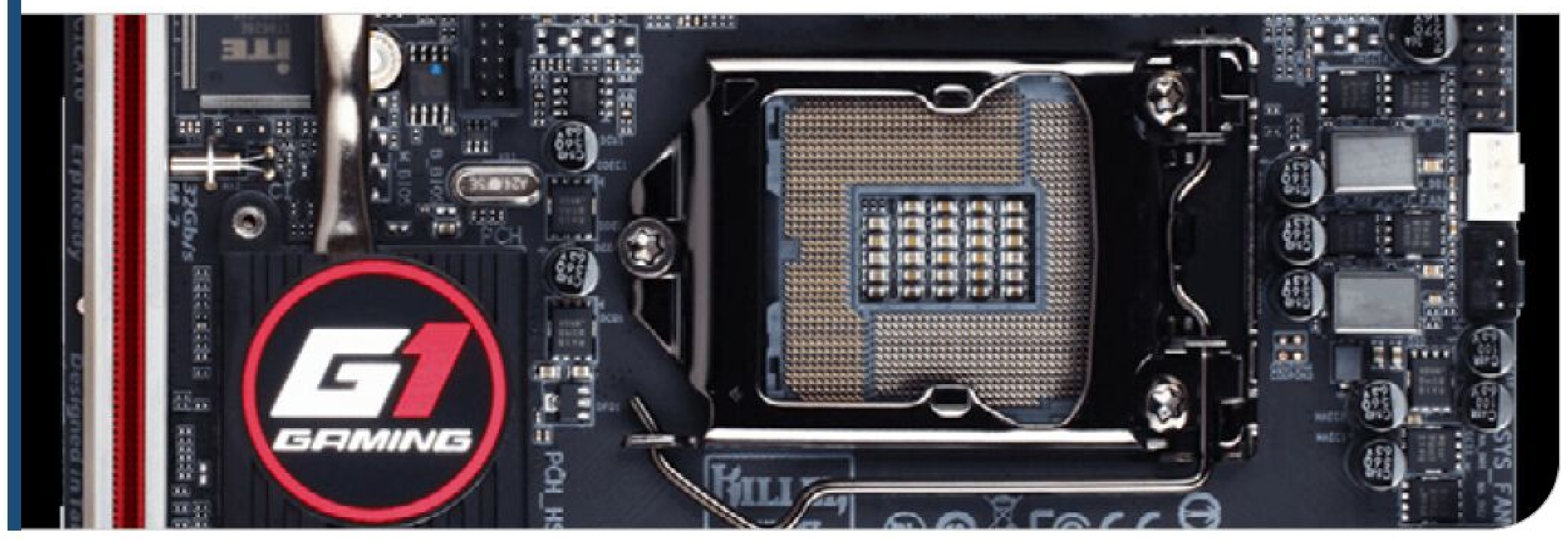
SOCKET TYPE

Although all processors might look, on the outside, pretty identical they are almost continually being improved and updated, and will only fit into certain sockets. Once more your motherboard choice is going to be dictated by the processor you plan to use. We are using an Intel Core i5-6600K processor in our build, so our motherboard had to have an LGA 1151 socket. It wouldn't have fitted into the slightly newer LGA 2011 socket used by an Intel Core i7-6800K. AMD use a different but similar system. Here your choice will be between AM1, AM3+, FM2 and FM2+. Whichever you go for, make sure the motherboard socket matches your CPU, or it will be an expensive mistake.



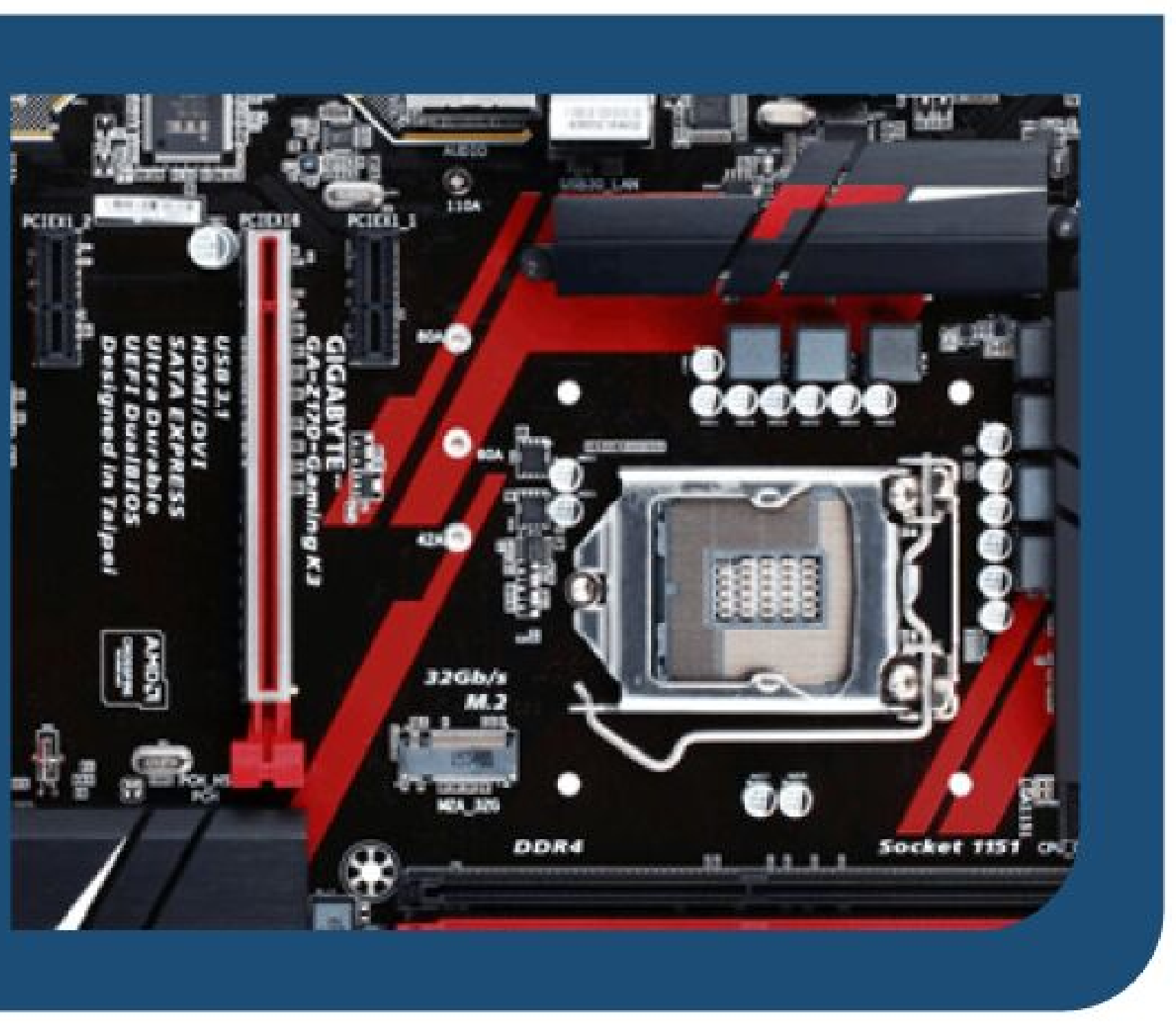
FORM FACTOR

Hopefully you now know the socket and chipset type you want your motherboard to have, so now it is time to decide on the size or form factor of the board. Motherboards are unequally divided into four main sizes (largest to smallest): E-ATX, ATX, mATX and ITX (or Mini ITX). Whilst it is possible to find boards in each size with a full complement of features, this is more about matching the motherboard to the case you are using, or vice versa. E-ATX boards will only fit in E-ATX cases; ATX will fit in ATX and often E-ATX; mATX will fit in ATX and mATX cases; and ITX normally only fits in ITX cases. ATX is the most standard of the sizes, so you will have a better choice and be more likely to get a good deal.



MOTHERBOARD FEATURES

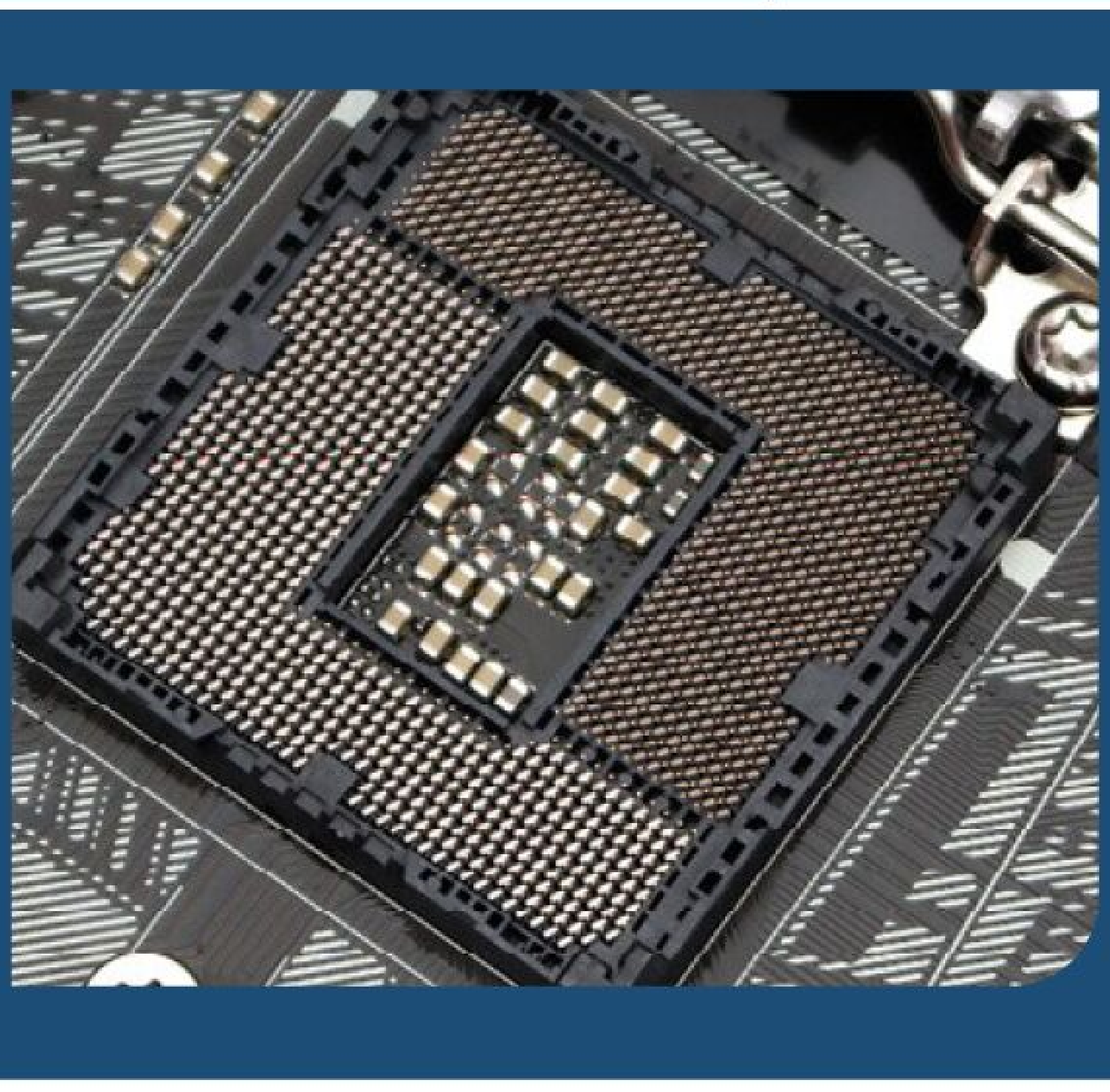
Most current motherboards offer a broadly similar range of sockets, ports and features. Most if not all, will include multi-channel on-board audio, multiple SDRAM sockets, PCIe sockets, basic on-board graphics, LAN port, HDMI and DVI support, and much more. However, and as with everything, the more you spend the more you can expect. Gaming motherboards may feature lighting and on-board cooling; media boards may give you 7.1 channel HD audio and extra USB 3 connections. Think about what you want to do with your PC and try to find a board that offers the level of features you want.



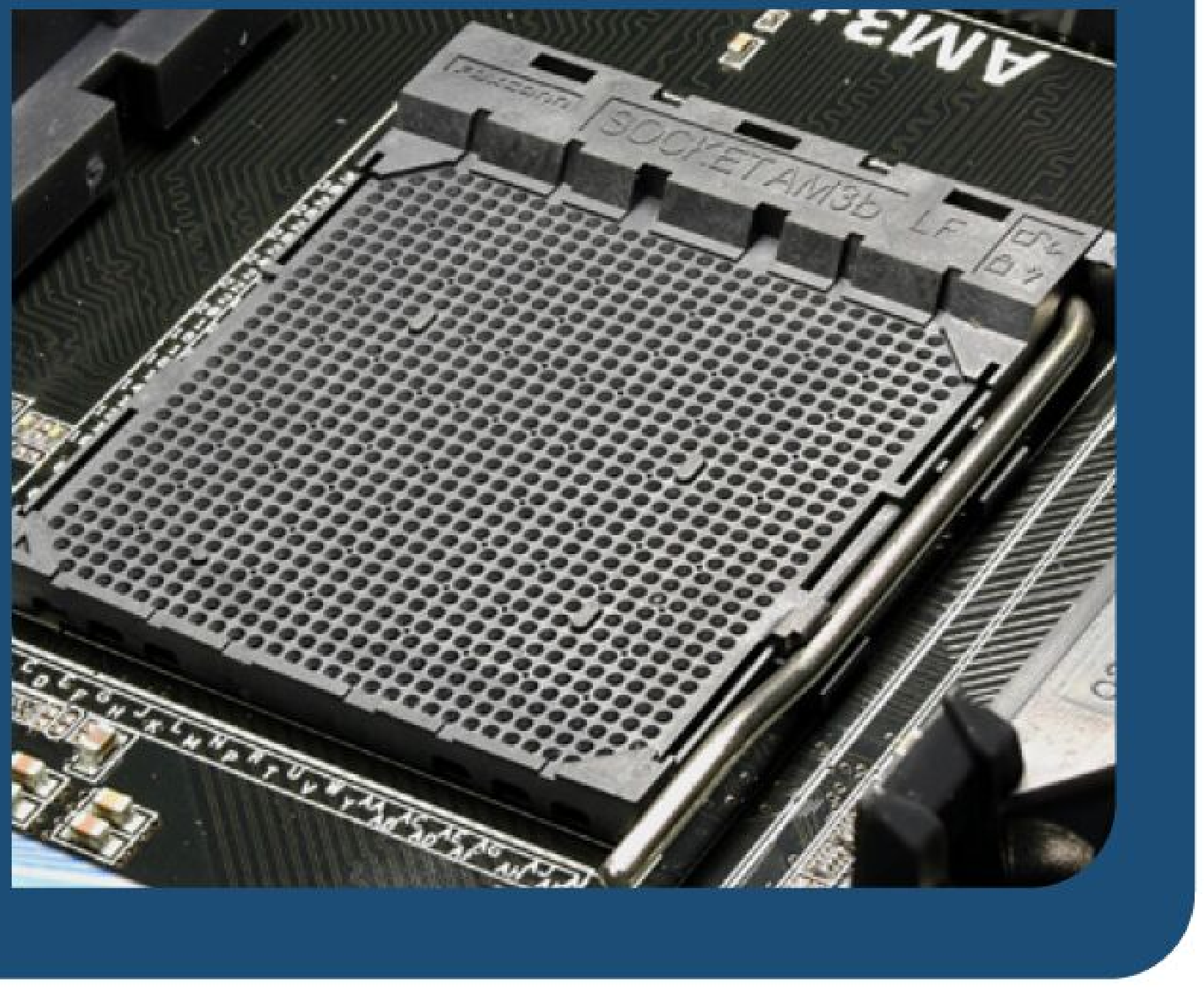
CPU SOCKET COMPARISON

Intel and AMD processors use completely different types of socket, so an Intel CPU won't fit into AMD motherboard.

Intel LGA 1151 Socket
Intel processors are built with the contact pads on the bottom of the chip and the pins that connect to those contacts are in the socket on the motherboard.



AMD AM3+ Socket
AMD processors are made the other way around, with the pins on the bottom of the processor, which fit into individual contact points in the motherboard socket.



Recommended Minimum Specification

The motherboard you choose for your build needs to be up to a variety of tasks, be able to support a number of components and be suitable for your daily use. The exact specification you need may well be different to the specification another builder needs but there is certainly a base level of features you should look out for when you make your choice.

GAMING/MEDIA BUILD

With a gaming or media build, you'll be needing support for HD displays, faster memory, etc.

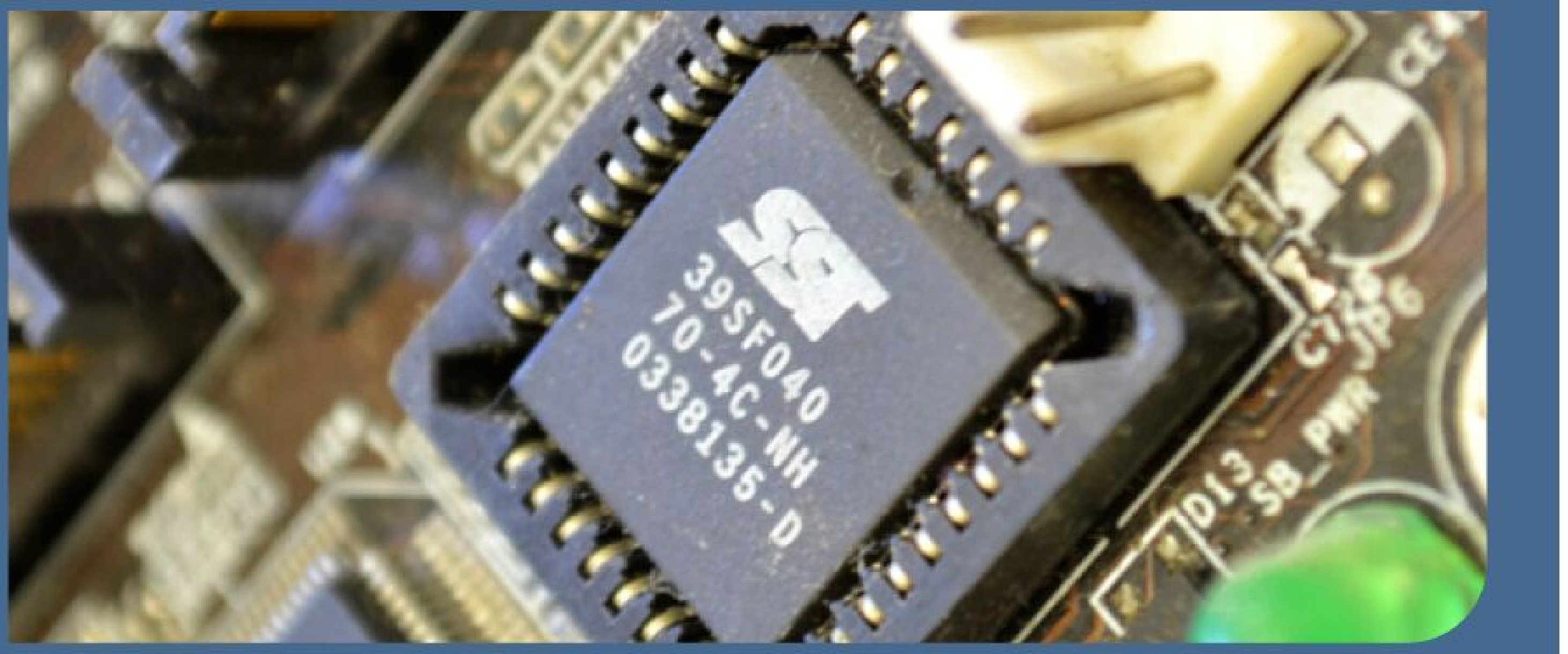
- 4 x DDR3 or DDR4 DIMM sockets supporting up to 64 GB of system memory
- Dual channel memory architecture
- Support for DDR3 1600/1333 MHz memory (minimum)
- Support for Extreme Memory Profile (XMP) memory modules
- Integrated Graphics Processor - Intel HD Graphics support
- Sli or CrossFire Support
- 1 x D-Sub port, 1920x1200@60 Hz
- 1 x DVI-D port, 1920x1200@60 Hz
- 1 x HDMI port, 4096x2160@24 Hz
- High Definition Audio 2/4/5.1/7.1 channel
- High Speed LAN chip (10/100/1000 Mbit)
- 1 x PCI Express x16 slot, running at x16 (PCIEX16)
- 1 x PCI Express x16 slot, running at x4 (PCIEX4)
- 2 x PCI Express x1 slots
- 2x PCI slots
- 1 x M.2 Socket 3 connector
- 3 x SATA Express connectors
- 6 x SATA 6Gb/s connectors
- Support for RAID 0, RAID 1, RAID 5 and RAID 10
- up to 8 x USB 3.0/2.0 ports
- 6 x USB 2.0/1.1 ports

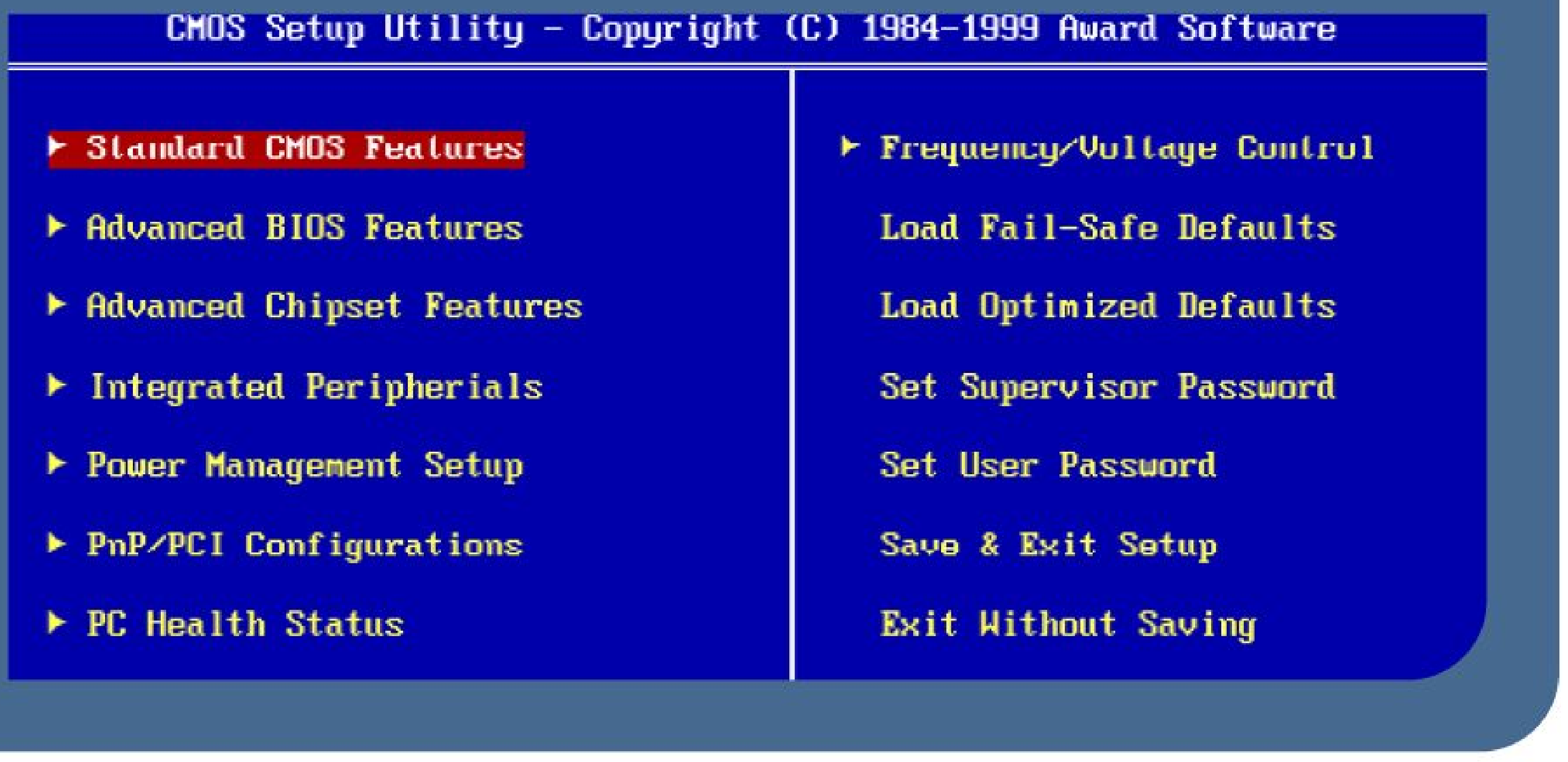
WHAT IS BIOS? |

The BIOS (Basic Input/Output System) is an often overlooked but absolutely vital part of your computer system. The BIOS is particular to each type of motherboard and is provided by the motherboard manufacturer. You see it every time you switch your computer on and it's responsible for those lines of text that flash up on the screen before Windows launches, listing things like installed RAM and other hardware details.

It's the core software of your system and boots up the computer, launches Windows and in some cases allows Windows and other apps to access things like hard drives, the keyboard, USB connections and other hardware components. The BIOS is built in to your system and is stored on a type of flash memory chip on your computer's motherboard. For this reason it is often referred to as "firmware", since it is in part both software and hardware.

You can see which version of the firmware your particular motherboard ships with by looking for the label printed on the board itself. You can then check on the manufacturer's website to see if you will need to update the BIOS after installation.

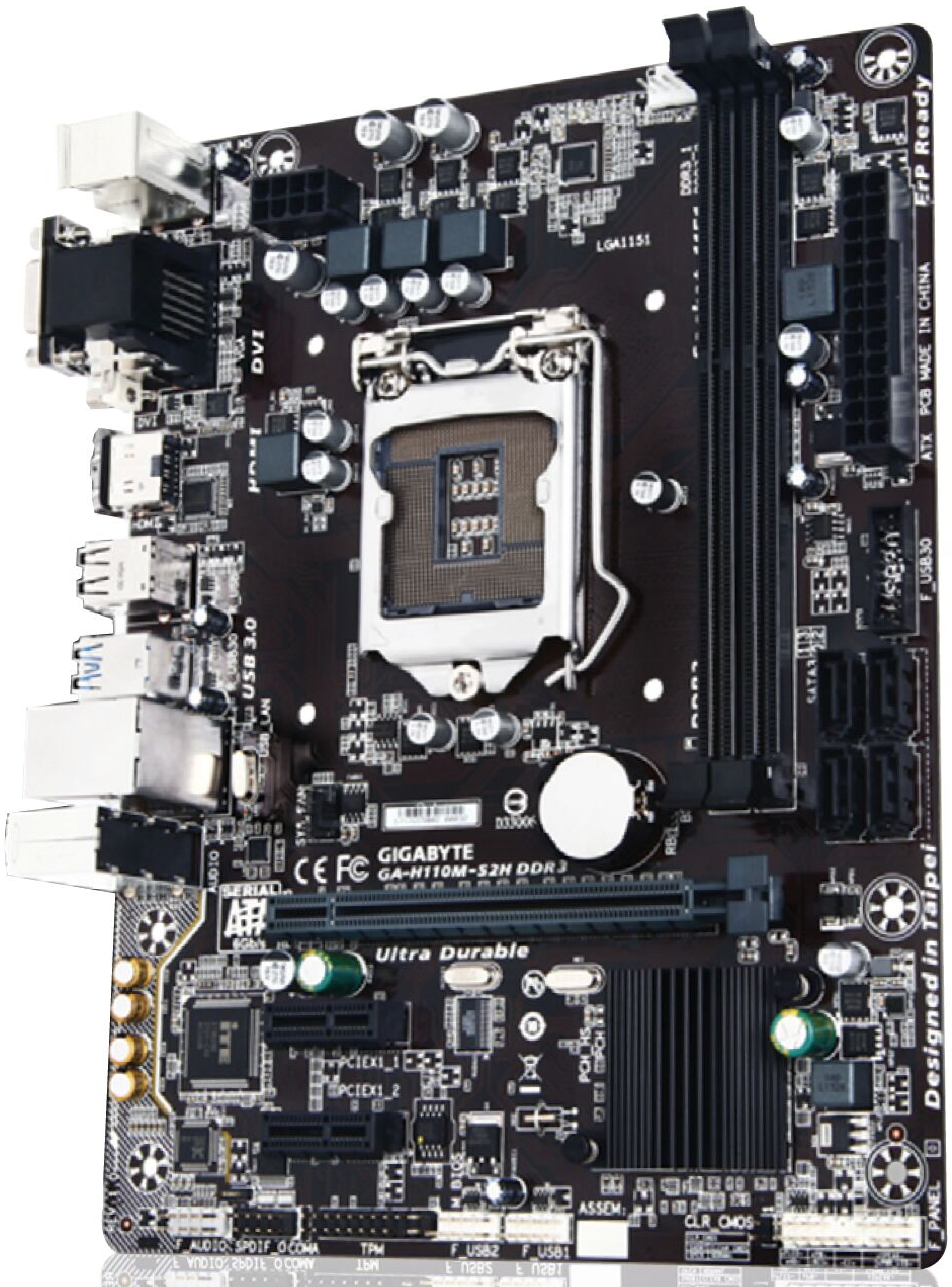

39SF040
70-4C-NH
0338135-D


CMOS Setup Utility - Copyright (C) 1984-1999 Award Software
▸ Standard CMOS Features
▸ Advanced BIOS Features
▸ Advanced Chipset Features
▸ Integrated Peripherials
▸ Power Management Setup
▸ PnP/PCI Configurations
▸ PC Health Status
▸ Frequency/Voltage Control
Load Fail-Safe Defaults
Load Optimized Defaults
Set Supervisor Password
Set User Password
Save & Exit Setup
Exit Without Saving

GENERAL/BUSINESS BUILD |

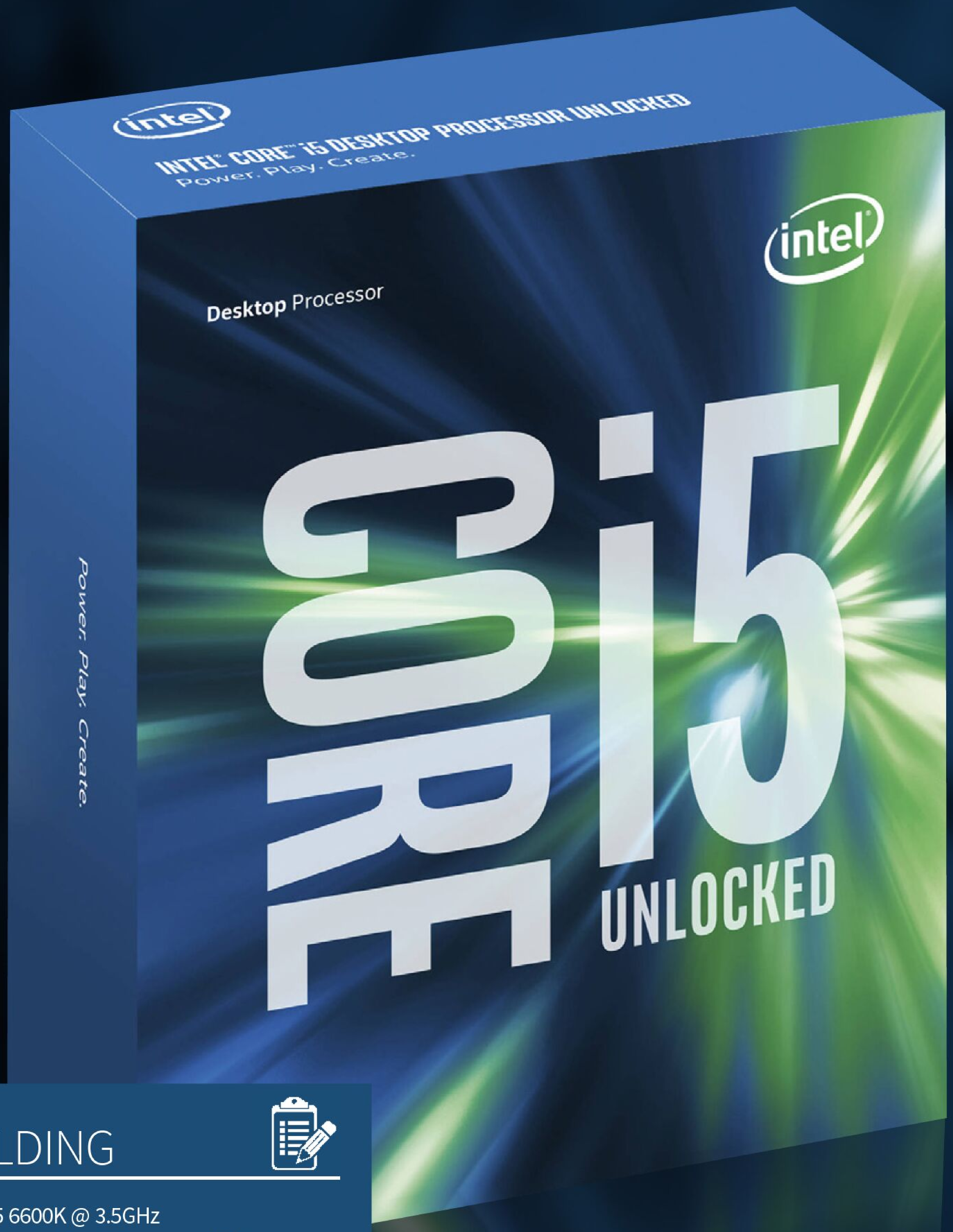
Although a motherboard designed for gaming will work in a general build, if you don't plan on doing any gaming, you can save money on those features.

- 2 x DDR3 DIMM sockets supporting up to 32 GB of system memory
- Dual channel memory architecture
- Support for DDR3/DDR3L 1600/1333 MHz memory modules
- Support for ECC UDIMM 1Rx8/2Rx8 memory modules (operate in non-ECC mode)
- Support for non-ECC UDIMM 1Rx8/2Rx8 memory modules
- On-board Graphics - Integrated Graphics Processor
- 1 x D-Sub port, supporting a maximum resolution of 1920x1200@60 Hz
- 1 x DVI-D port, supporting a maximum resolution of 1920x1200@60 Hz
- High Definition Audio 2/4/5.1/7.1 channel
- Support for S/PDIF Out
- High Speed LAN chip (10/100/1000 Mbit)
- 1 x PCI Express x16 slot, running at x16 (PCIEX16)
- 1 x PCI Express x1 slot
- 2 x PCI slots
- 4 x SATA 6Gb/s connectors
- 4 x USB 3.0/2.0 ports
- 8 x USB 2.0/1.1 ports


GIGABYTE
GA-H110M-S2H DDR3
Ultra Durable
ErP Ready
Designed in Taipei
LGA1151
DVI
USB 3.0

Choosing a Processor

The CPU (Central Processing Unit) of your computer is likely to be the most expensive single component, especially if you are trying to future-proof your build as much as possible. When it comes to choosing a processor, faster and newer is almost always better. However, does the average PC builder really need a 4GHz Core i7? Does having a faster CPU always mean having a faster computer overall? What is hyper-threading? Read on to find the answers to these questions and many more.


intel
INTEL CORE i5 DESKTOP PROCESSOR UNLOCKED
Power. Play. Create.
intel
Desktop Processor
Power. Play. Create.
CORE i5
UNLOCKED

START BUILDING

Processor: Intel Core i5 6600K @ 3.5GHz
Build: Turn to page 62 to start installing your CPU

Making Your Choice

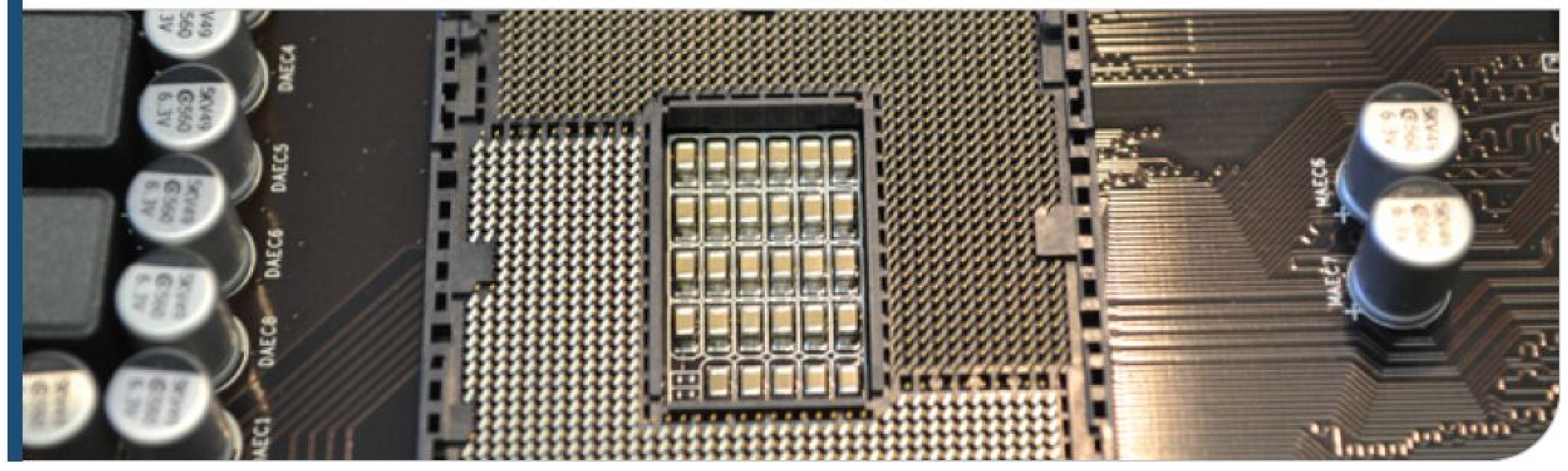
For many PC builders the choice of processor is key to the whole project and will largely dictate the rest of the components required.

INTEL OR AMD

Although your only two choices of processor manufacturers are Intel or AMD, there are several different categories of processor from each of these chip makers. Intel is by far the market leader, offers the widest range both in terms of speed/power and price and tends to be ahead in terms of features and technological advances. AMD make some great processors too and they are generally cheaper to buy, and a good choice if you are on a very tight budget. Our choice, and our recommendation, is Intel. More specifically one of the Skylake Core i5 range that offers good speed, power and value for money.

SOCKET TYPE

As processors improve, the number of pins or connectors usually increases as well. This means that an Intel processor designated LGA 1150 (the Haswell family) won't fit into a socket designed for a LGA 2011 (the numbers here refer to the number of pins on the chip). These are called processor generations and it is always better to buy the newest generation if you can afford it. This provides a degree of futureproofing but probably won't be the best value for money. You can only futureproof so much anyway. If you plan to have your computer for more than a couple of years, it is unlikely that any CPUs released after this time will fit anyway. Just ensure that the processor you choose matches the motherboard socket or vice versa.



PROCESSOR SPEED

Both Intel and AMD processors are sold as being a certain speed. Our Intel Core i5 runs at 3.5GHz but as it is a K model, it is possible to overclock it using additional software. The speed of a processor refers to Clock Speed or Clock Rate, which used to be a simple way to compare two different chips. Faster clock speed meant a faster chip and this is still true if comparing two chips from the same family (two Intel Skylake CPU's for example). As a general rule go for the CPU with the fastest speed in the family you want to use. Just be aware that higher clock speed also means higher price, possibly with only a small performance increase.

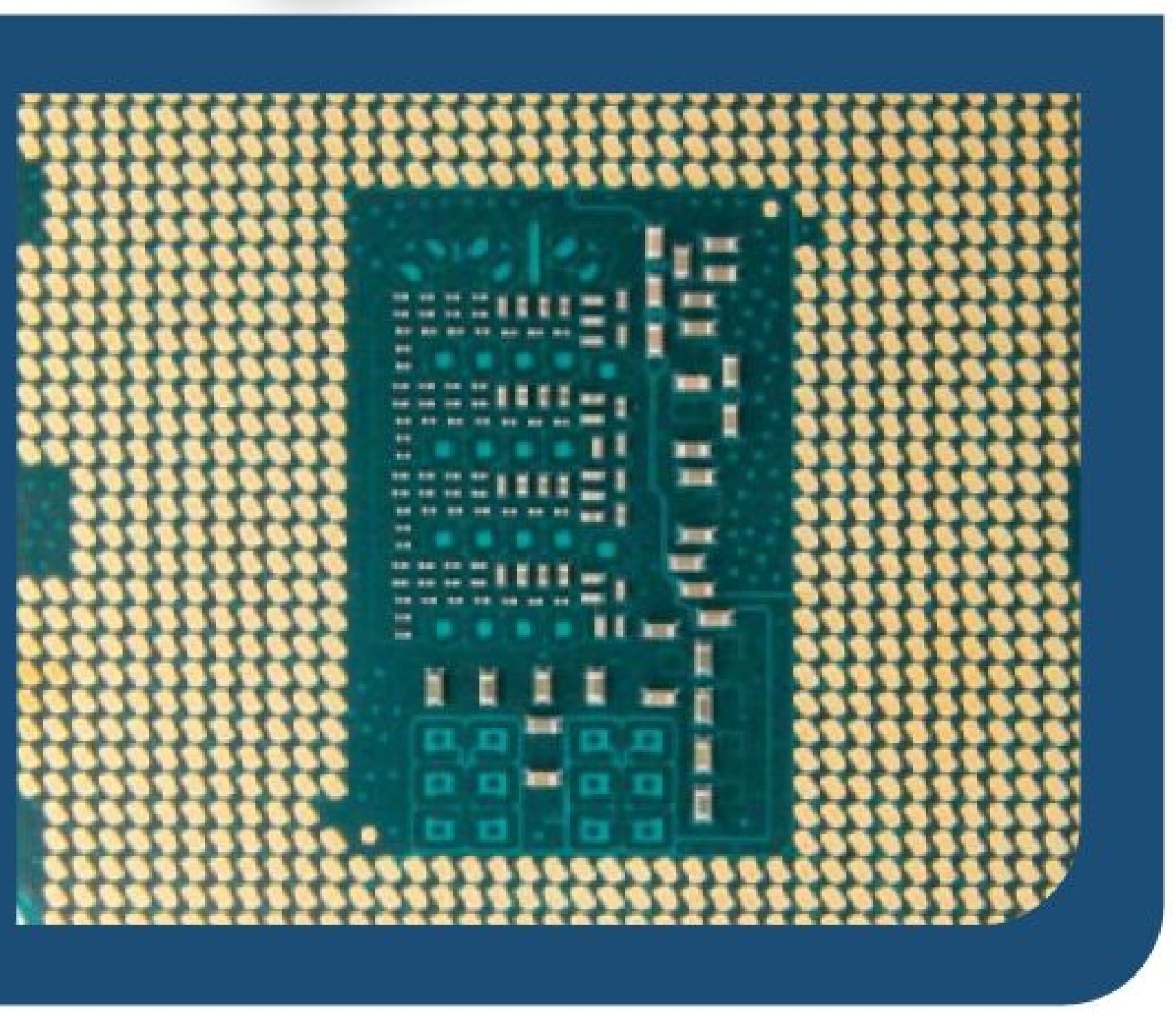
CPU OR APU

CPUs, or Central Processing Units, have been the norm in computers for a long time, but a couple of years ago AMD launched a range of APUs. APU, or Accelerated Processing Unit, is a processor and graphics accelerator on a single chip. The PlayStation 4 and Xbox One both use a type of APU. The latest version of the AMD APU is called Carrizo. For most general builds, we would suggest that getting a dedicated graphics card is a better option but if you are on a very tight budget, this can make sense. It is also an option if you are building a very small ITX-based computer such as a media box.

AMD
A SERIES

WHAT'S NEXT FOR CPU'S?

As mentioned previously, trying to keep up with the latest processor generation is about as easy as herding kittens. It is also an expensive proposition but that doesn't mean that it isn't worth keeping an eye on what the market is doing. When new generations are released, the generation that went before normally drops in price quite quickly, meaning that there are good deals to be had. The next generation of Intel processors is codenamed Kaby Lake and due to arrive in late 2016. AMD's newest chip generation will be called Zen, also due at the end of the year.



The Processors we Considered

These are the four processors we considered while planning our PC build, two from Intel and two from AMD, with their relative strengths and weaknesses.

AMD RYZEN 5 2400G

FROM: £146.00 $180.00 €145.00

Pros

- Budget quad-core CPU
- Low power usage
- Built-in Vega 11 GFX

Cons

- Only 4MB L3 Cach
- Not built for gaming
- No overclocking

AMD RYZEN 7 2700X

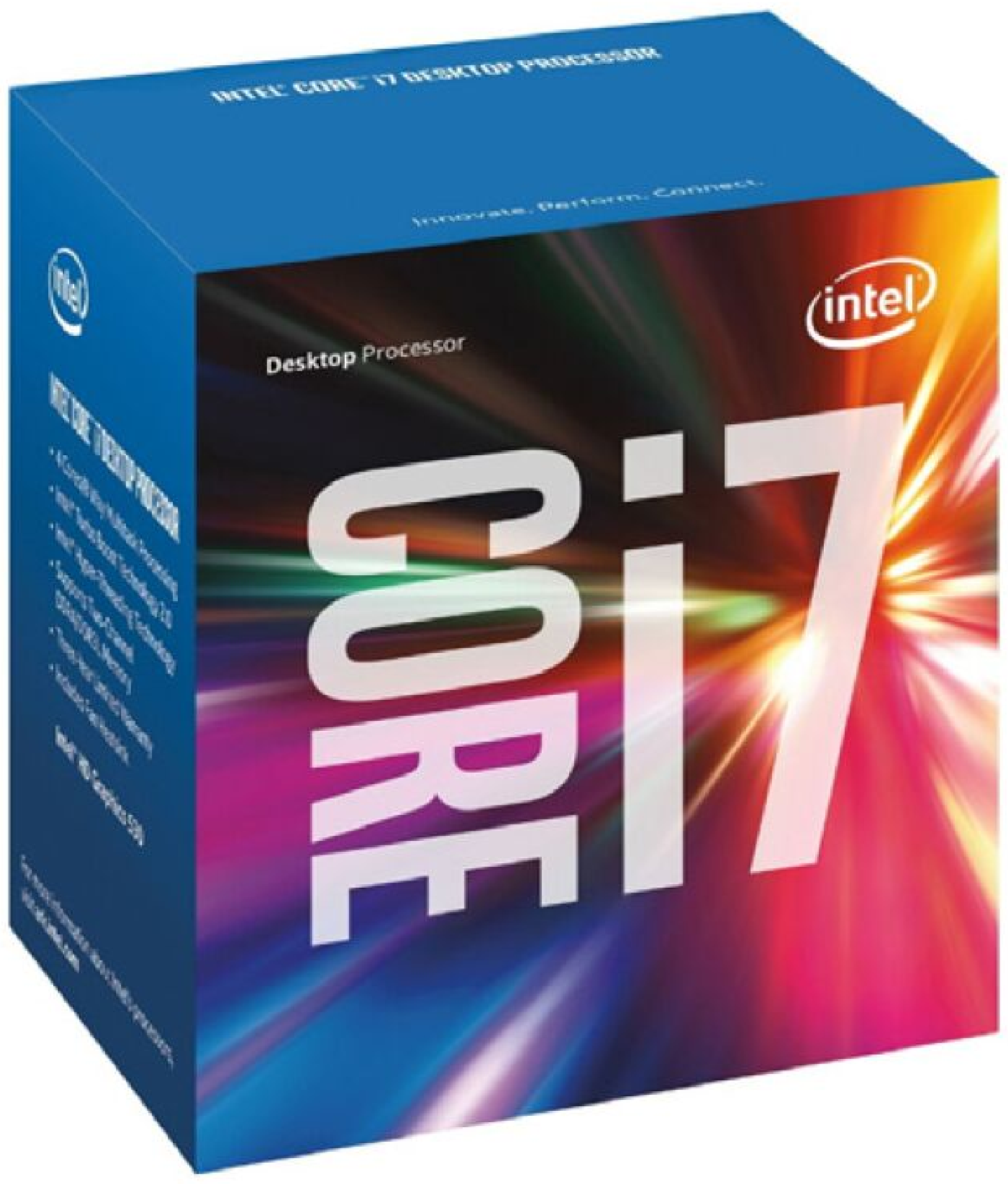
FROM: £290.00 $310.00 €290.00

Pros

- 8 cores and 16 threads
- High turbo clock speed
- Wraith cooler included

Cons

- Too expensive for budget
- Some gaming limitations
- High power usage



INTEL CORE I7 6700 3.4GHZ

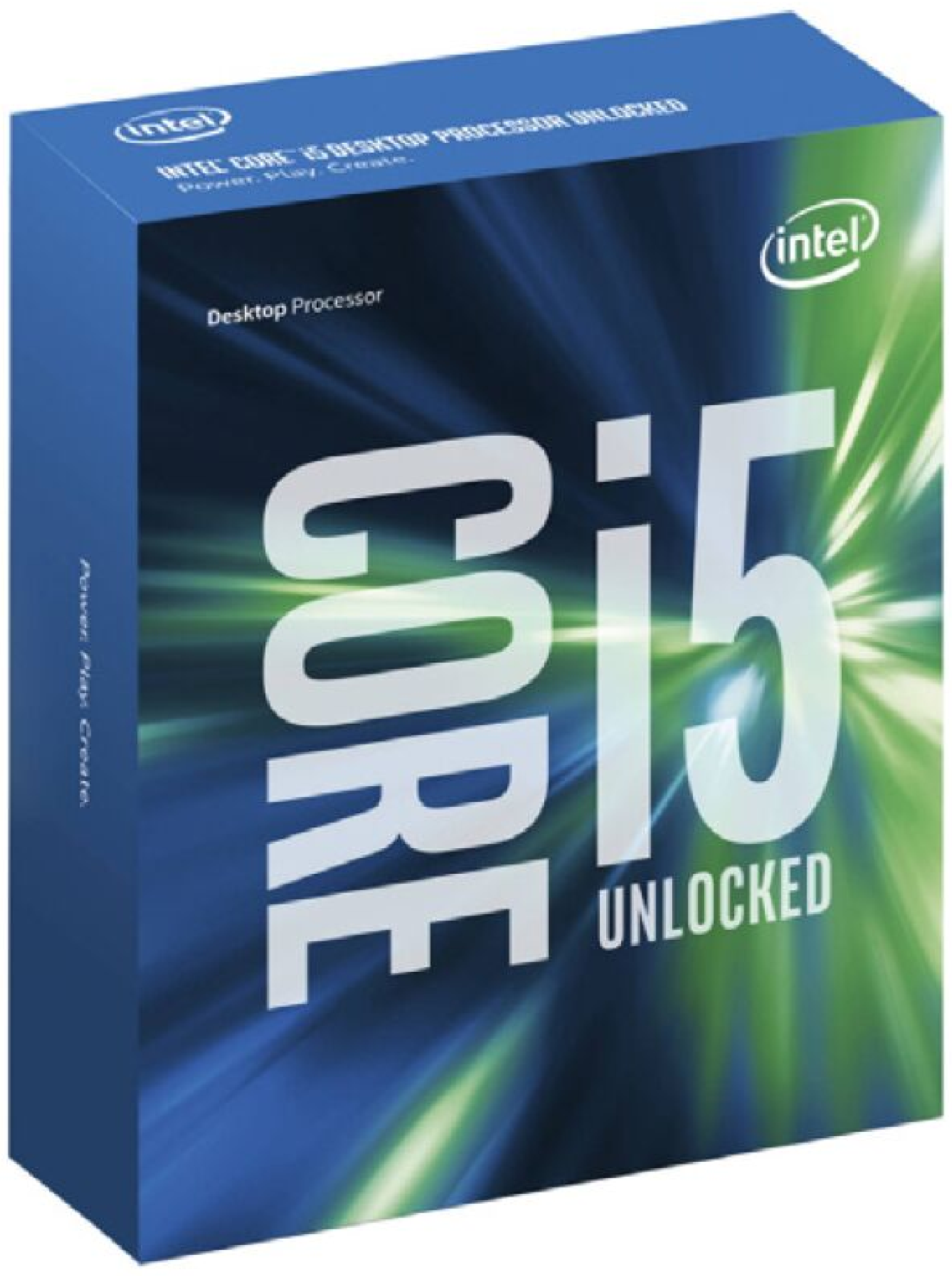
FROM: £270.00 $305.00 €300.00

Pros

- Good clock rate
- Supports hyper-threading
- Low power requirements
- Latest generation Intel

Cons

- Too expensive for the budget
- Locked clock rate



INTEL CORE I5-6600K 3.5GHZ

FROM: £150.00 $180.00 €175.00

Pros

- Good value for speed
- Intel Skylake
- Unlocked clock rate
- Good benchmarks

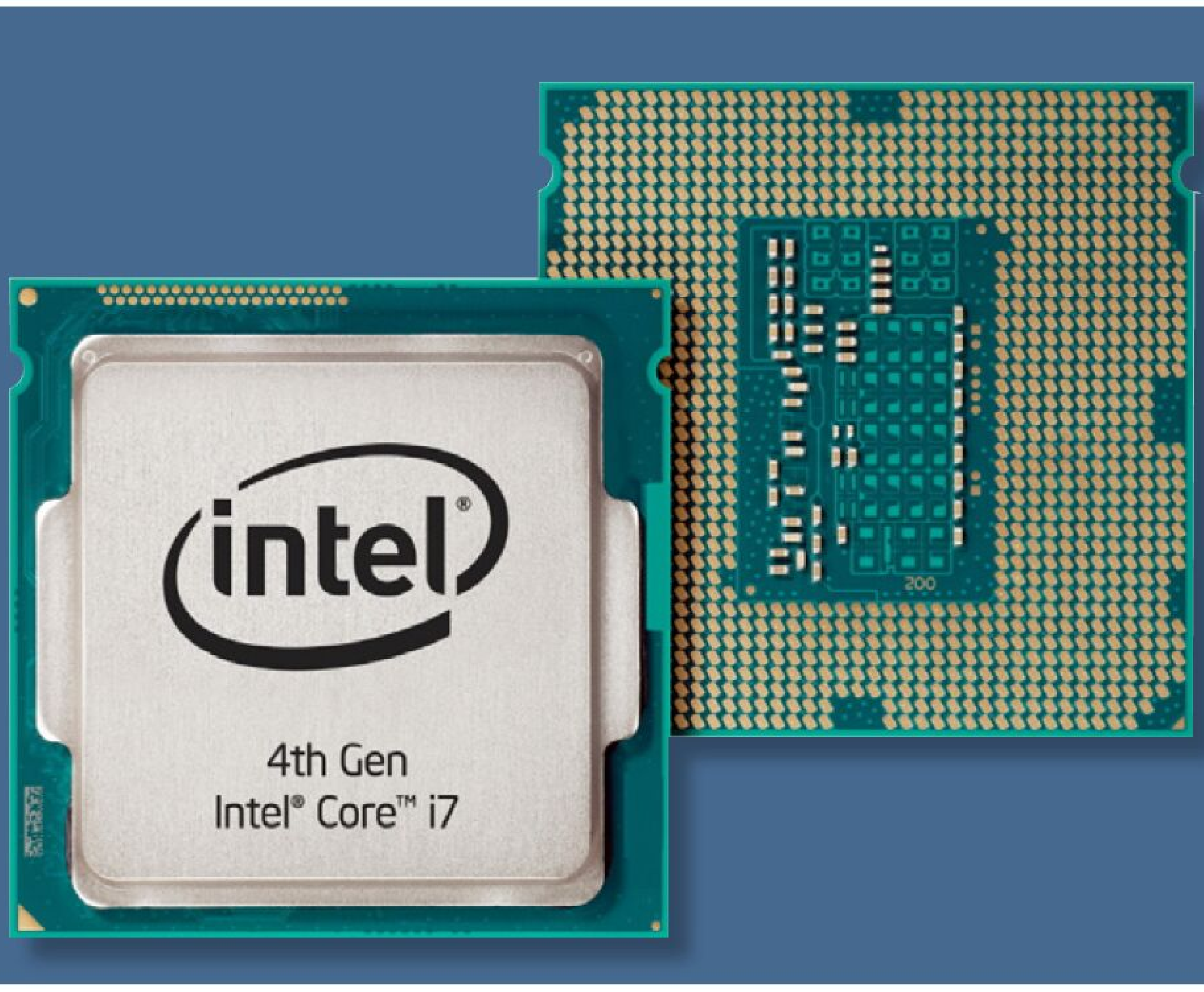
Cons

- Can run slightly hot
- Only 6MB L3 Cache

DO YOU NEED HYPER-THREADING? |

The answer to that question depends very much on what you plan to be doing on your computer in the future. Intel Hyper-Threading Technology (or HT Technology) uses processor resources more efficiently, enabling multiple threads to run on each core. As a performance feature it also increases processor throughput, improving overall performance on threaded software.

Intel HT Technology is available on the Intel Core processor family, the Intel Core M processor family and the Intel Xeon processor family. By combining one of these Intel processors and chipsets with an operating system and BIOS supporting hyper-threading, you can run demanding applications simultaneously whilst maintaining system responsiveness. Then create, edit and encode graphically intensive files while running background applications, such as virus protection software, without compromising system performance.

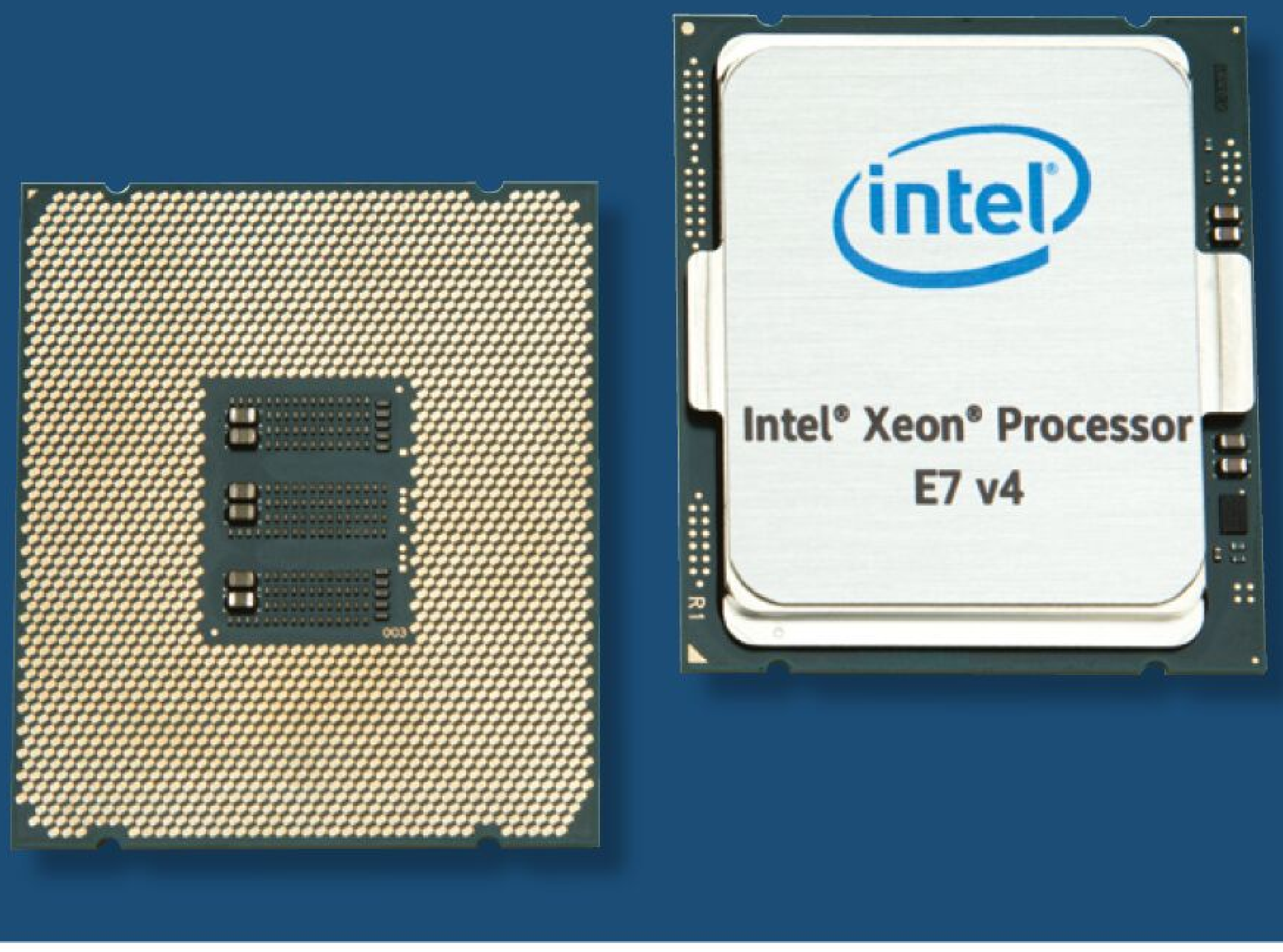


MULTI-CORE CPUS |

Processing performance of computers is increased by using multi-core technology. This essentially is plugging two or more individual processors (called cores in this sense) into one integrated circuit. Ideally, a dual core processor would be nearly twice as powerful as a single core processor. In practice the performance gain is far smaller, only about 50%, due to imperfect software algorithms and implementation.

Increasing the number of cores in a processor, dual-core, quad-core, etc. increases the workload that can be handled. This means that the processor can now handle numerous asynchronous events, interrupts, etc. which can take a toll on the CPU when overwhelmed.

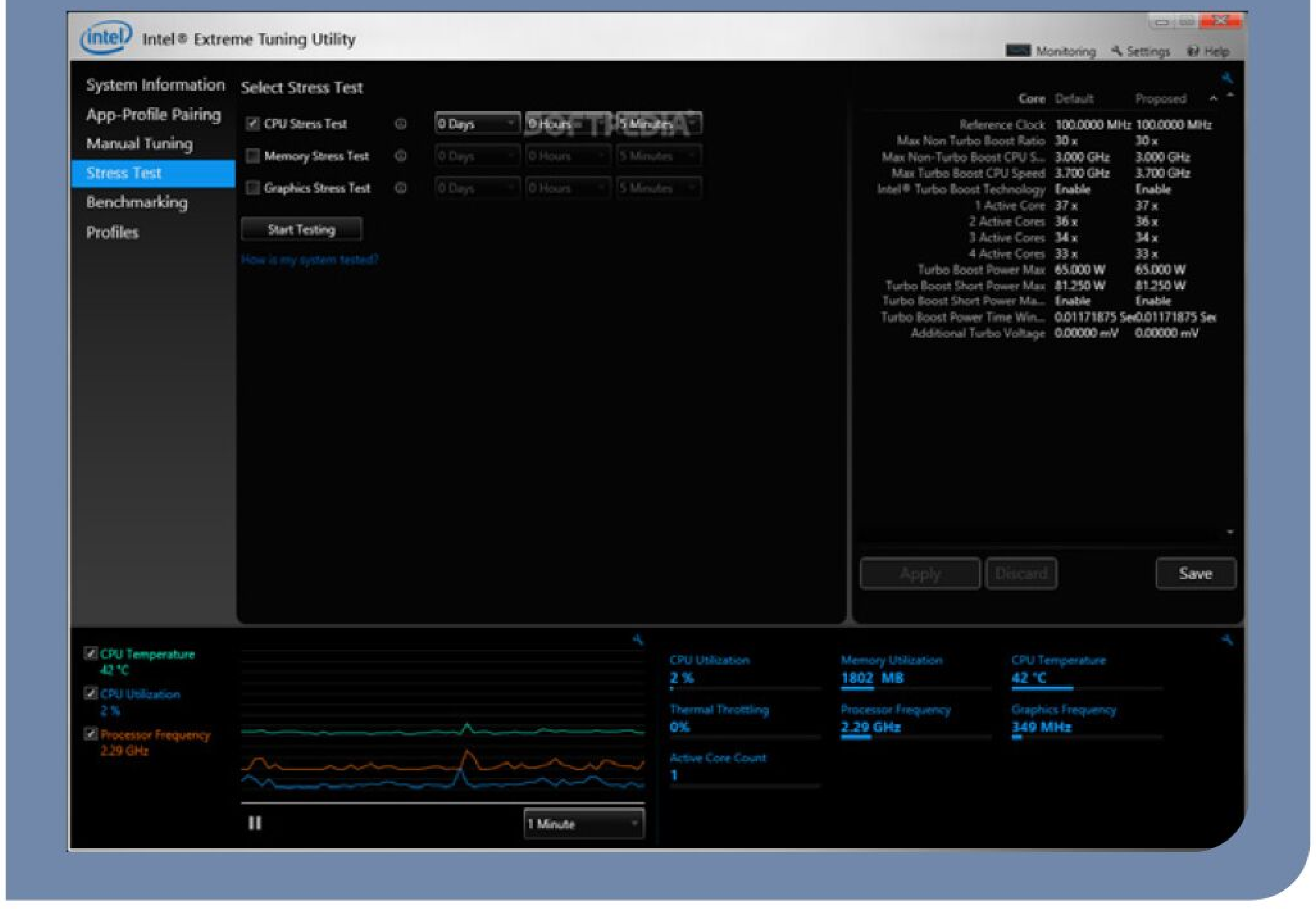
These cores can be thought of as different sections in a factory, with each section handling a different task. Sometimes, these cores will handle the same tasks as cores adjacent to them if a single core is not enough to handle the information.



OVERCLOCKING THE CPU |

Most modern CPUs have their clock rate locked, so that they cannot go over a certain speed and burn out. However, understanding the need for some PC builders to want to tinker with every component, there are CPUs available in each generation which have their clock rate unlocked. For both Intel and AMD chips, this is shown by a K in the name (such as our i5 6600K) and AMD often call CPUs that can be overclocked “Black Edition”.

Overclocking has been made easier in recent years by the release of overclocking software and tools. It is, however, not something that the novice PC builder should try without some serious research and after taking every possible precaution. This would include having a third-party CPU cooler installed, which you can read more about later in this guide.



☑ CPU Stress Test 0 Days 0 Hours 5 Minutes
☐ Memory Stress Test 0 Days 0 Hours 5 Minutes
☐ Graphics Stress Test 0 Days 0 Hours 5 Minutes

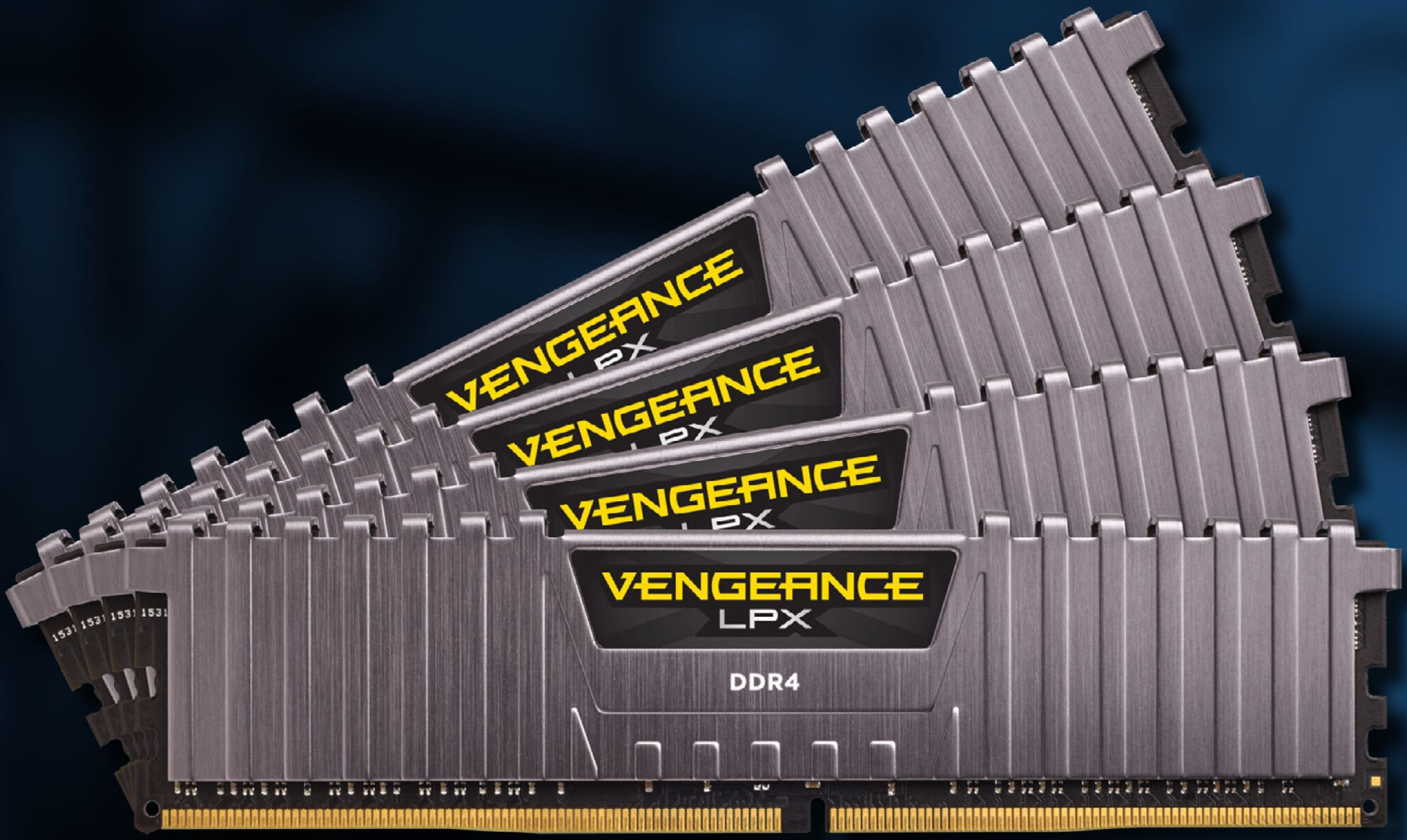
Core	Default	Proposed
Reference Clock	100.0000 MHz	100.0000 MHz
Max Non Turbo Boost Ratio	30 x	30 x
Max Non-Turbo Boost CPU S...	3.000 GHz	3.000 GHz
Max Turbo Boost CPU Speed	3.700 GHz	3.700 GHz
Intel® Turbo Boost Technology	Enable	Enable
1 Active Core	37 x	37 x
2 Active Cores	36 x	36 x
3 Active Cores	34 x	34 x
4 Active Cores	33 x	33 x
Turbo Boost Power Max	65.000 W	65.000 W
Turbo Boost Short Power Max	81.250 W	81.250 W
Turbo Boost Short Power Ma...	Enable	Enable
Turbo Boost Power Time Win...	0.01171875 Sec	0.01171875 Sec
Additional Turbo Voltage	0.00000 mV	0.00000 mV

☑ CPU Temperature 42 °C
☑ CPU Utilization 2 %
☑ Processor Frequency 2.29 GHz

CPU Utilization 2 %
Memory Utilization 1802 MB
CPU Temperature 42 °C
Thermal Throttling 0%
Processor Frequency 2.29 GHz
Graphics Frequency 349 MHz
Active Core Count 1

The Right RAM

A fast and easy way to add a performance boost to your PC is to install high quality, fast RAM (Random Access Memory). DDR4 is the latest variation of PC memory and is the fastest and most efficient yet but just like many other components in your build, RAM isn't quite as simple as it might at first seem. Different motherboards support different maximum amounts, as do different operating systems and it is available in many different speeds and configurations.



START BUILDING

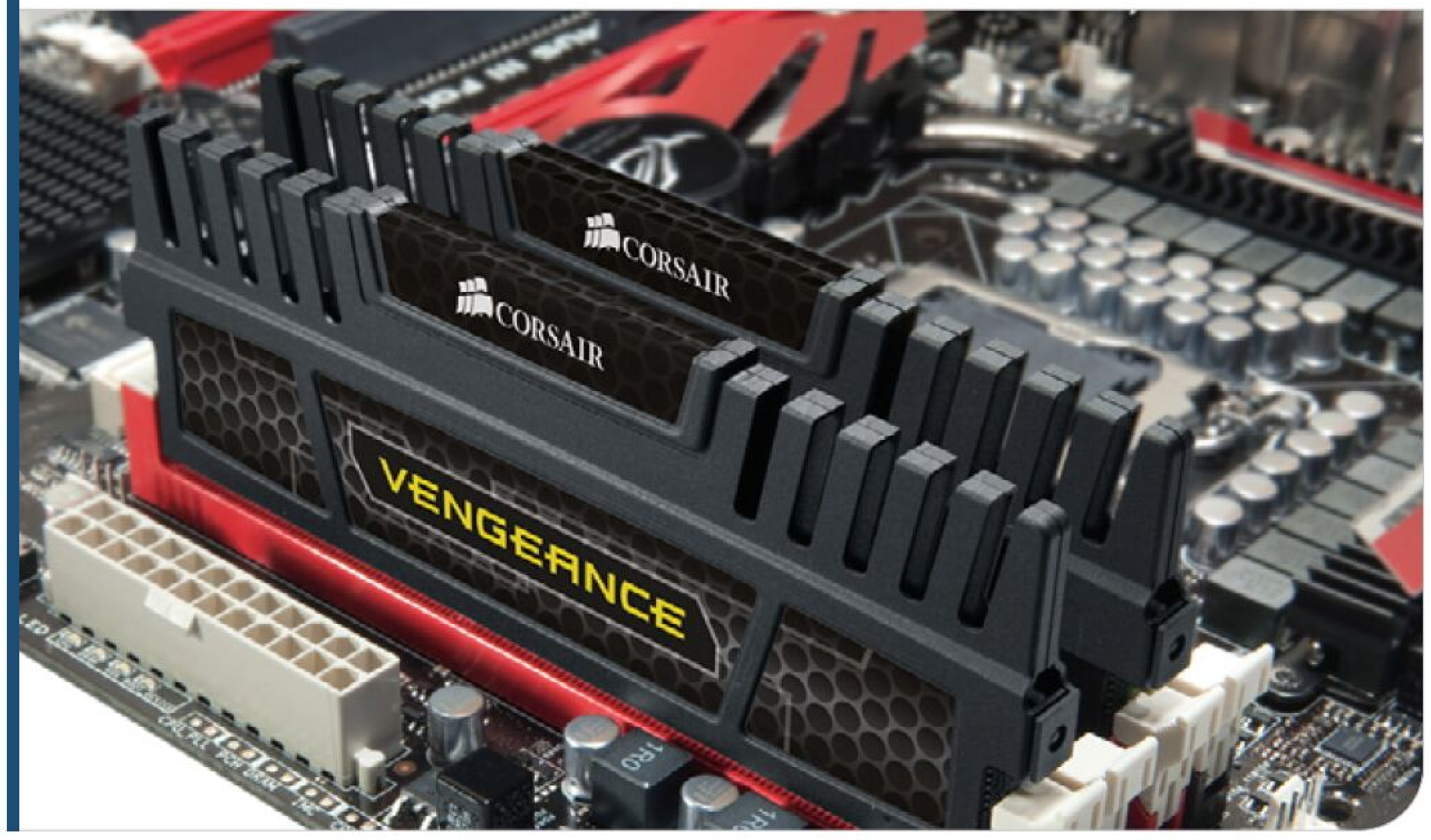
RAM: 16GB Corsair Vengeance DDR4 2133MHz
Build: Turn to page 66 to start installing your RAM

Making Your Choice

A lack of RAM has the potential to be a real power and speed bottleneck for your PC build, so getting it right is just as important as choosing the right CPU or graphics card.

HOW MUCH RAM?

Before we even look at speeds and channels, we should look at exactly how much RAM we need and how much our build can support. First stop should be the motherboard information sheet or website, as this will show the maximum amount of RAM it can take. General purpose motherboards might have two slots and a maximum of 16GB, whereas a media or gaming motherboard will normally have four slots, capable of taking 32-64GB. Next you need to check what your planned OS can support (see the table below). We recommend no less than 8GB but ideally 16GB, of fast SDRAM.



RAM SPEED

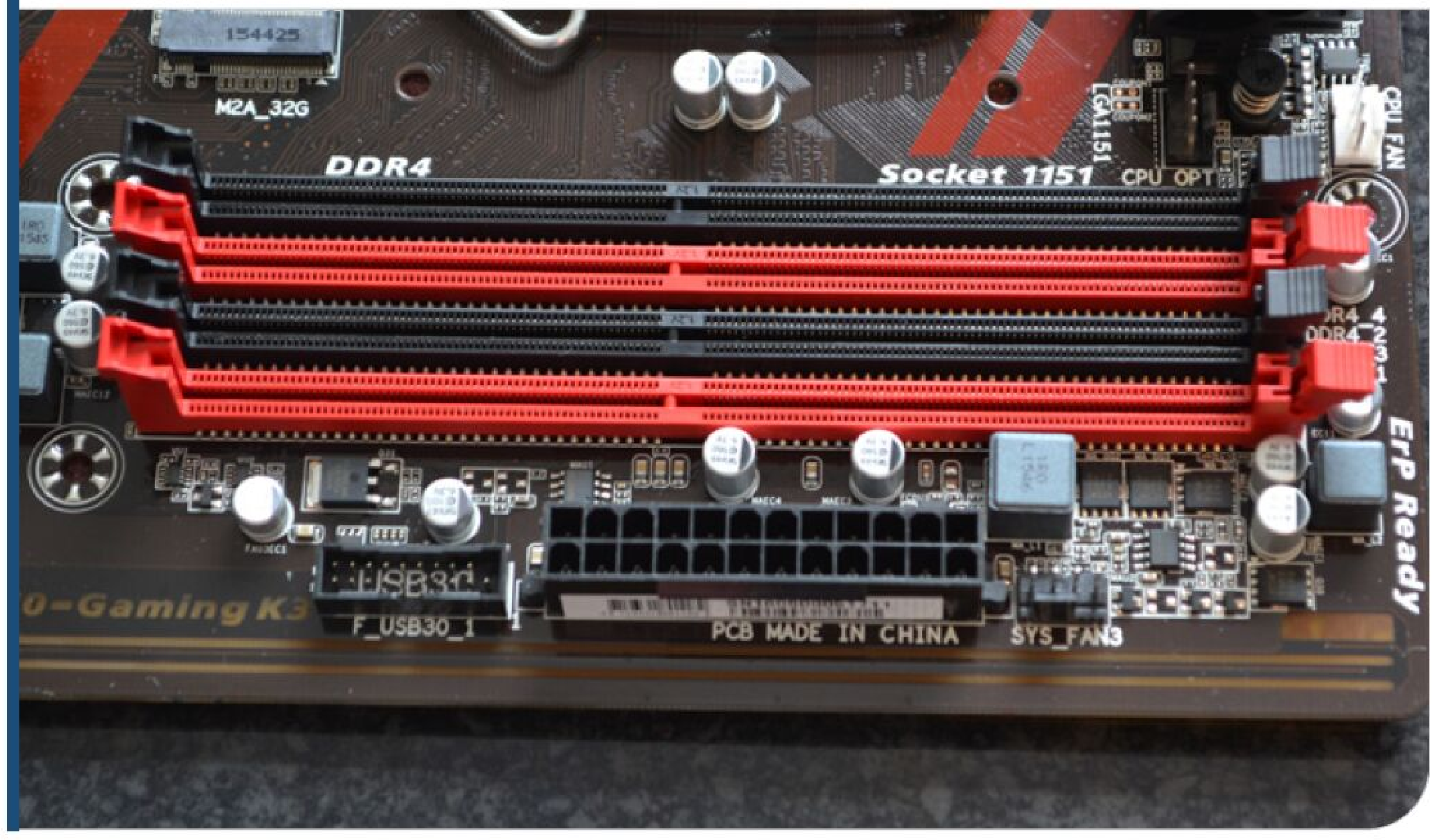
RAM is often talked about as if just putting more into your computer will magically make it run faster and smoother. This simply isn't the case. It is true that the RAM that is installed can be a performance bottleneck but just adding more isn't a guaranteed fix. If your motherboard supports it, it is probably better to have a single 8GB module of DDR4 3400MHz than 12 or 16GB of DDR3 1866MHz spread over two or three modules. If your motherboard and BIOS supports it, it can also be worth looking for SDRAM, as this will automatically overclock. If you do follow this route, make sure that the DIMM has a heat spreader.

DOUBLE DATA RATE

Double Data Rate or DDR memory has been the norm in PCs for more than 15 years. Each version of the DDR memory standard has improved on the last, with the current version being DDR4. Assuming that the motherboard you have chosen to use is fairly recent, your choices will be DDR3 or DDR4. There is not a huge performance increase between DDR3 2000MHz and DDR4 2133MHZ, so if you are planning to use the slowest DDR4, it might be better value to get the fastest DDR3. If your motherboard supports it however, DDR4 can go up to as high as 3400MHz; then you really will see a performance boost.

MATCHED PAIRS

Dual-channel architecture is a motherboard technology that essentially doubles the amount of available memory bandwidth. It's generally a good idea to match the two memory modules for best compatibility and many modules are sold as paired kits. If one module is rated at a slower speed than the other, for example if one is 1600MHz and the other is 2133MHz, both will run at the slower speed in dual-channel mode. If you're installing four modules they don't all need to be identical but make sure pairs match up accordingly and are installed in their respective slots. If your motherboard supports dual-channel the slots will be colour-coded.



WINDOWS MEMORY LIMITS

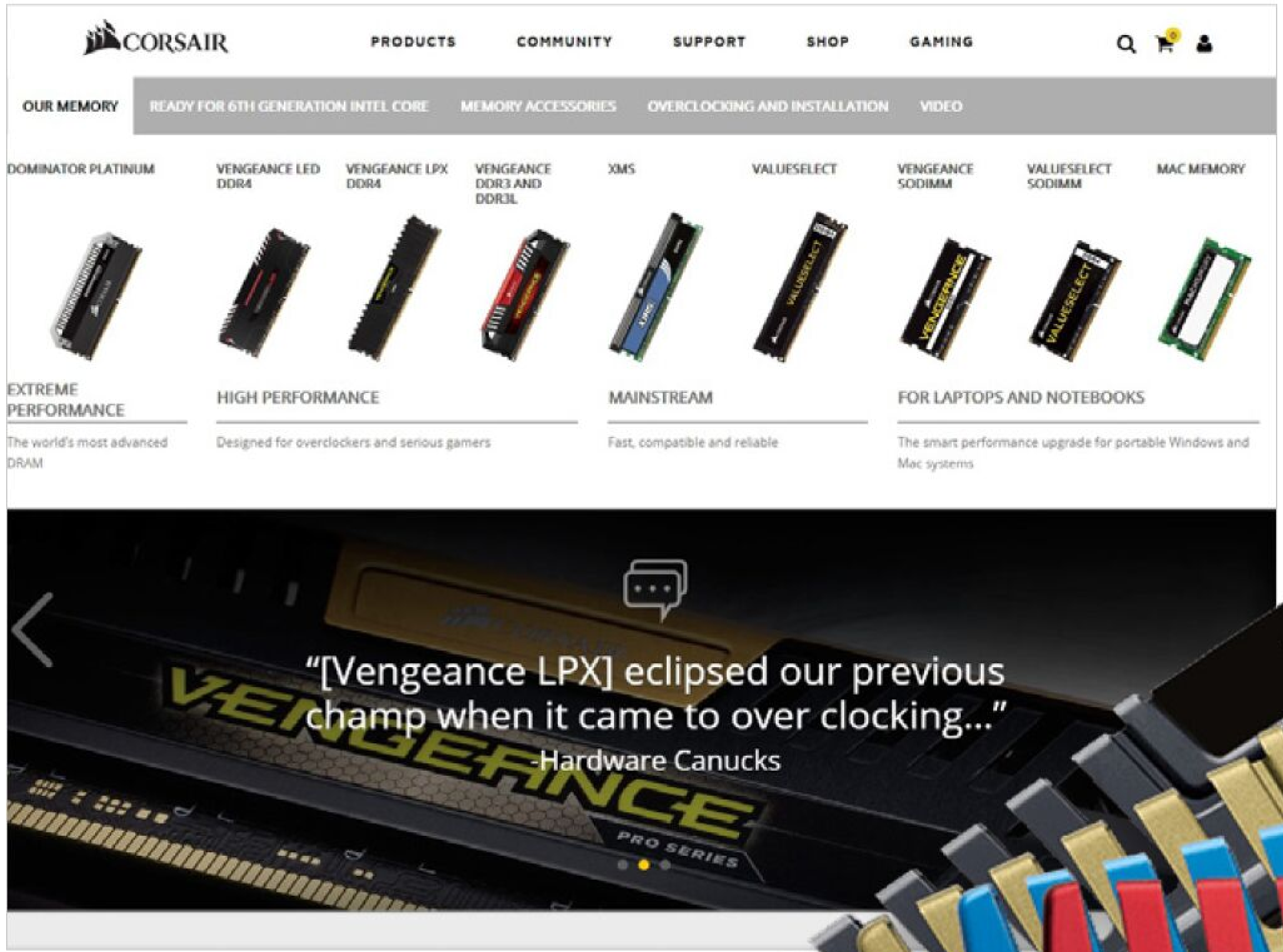
Assuming you are planning to install a 64-bit version of Windows on your new computer, you don't really need to worry about OS limits. If however, you are installing a 32-bit version, limits very much apply.

Windows Version	Limit for 32-bit	Limit for 64-bit
Windows 10 (Pro)	4GB	2TB
Windows 10 (Home)	4GB	128GB
Windows 8 (all versions)	4GB	128GB
Windows 7 (Home)	4GB	8GB
Windows 7 (Home Premium)	4GB	16GB
Windows 7 (all other)	4GB	192GB
Windows Vista	1 - 4GB	8 to 128GB

LATENCY TIMINGS

When you are comparing different SDRAM options for your build, you will almost certainly see some numbers like 14-16-16-31. This is the CL or CAS Latency. Column Access Strobe (CAS) latency is the delay time between the moment a memory controller tells the memory module to access a particular memory column on a RAM module, and the moment the data from the given array location is available on the module's output pins.

The memory timings are given through a series of numbers. For instance: 4-4-4-8, 5-5-5-15, 7-7-7-21 or 9-9-9-24. As a general rule, the smaller the numbers, the faster the memory; but we are talking about tiny amounts of time here. Don't get too hung up on CL timings when choosing memory. It can be a good way to choose between two otherwise similar matched pairs but unless you are building a very high spec rig, anything below CL 14 (in DDR4 memory) should be perfectly good. As with anything, the faster something is the more you tend to pay for it.


CORSAIR
PRODUCTS
COMMUNITY
SUPPORT
SHOP
GAMING
OUR MEMORY
READY FOR 6TH GENERATION INTEL CORE
MEMORY ACCESSORIES
OVERCLOCKING AND INSTALLATION
VIDEO
DOMINATOR PLATINUM
VENGEANCE LED DDR4
VENGEANCE LPX DDR4
VENGEANCE DDR3 AND DDR3L
XMS
VALUESELECT
VENGEANCE SODIMM
VALUESELECT SODIMM
MAC MEMORY
EXTREME PERFORMANCE
HIGH PERFORMANCE
MAINSTREAM
FOR LAPTOPS AND NOTEBOOKS
VENGEANCE
PRO SERIES

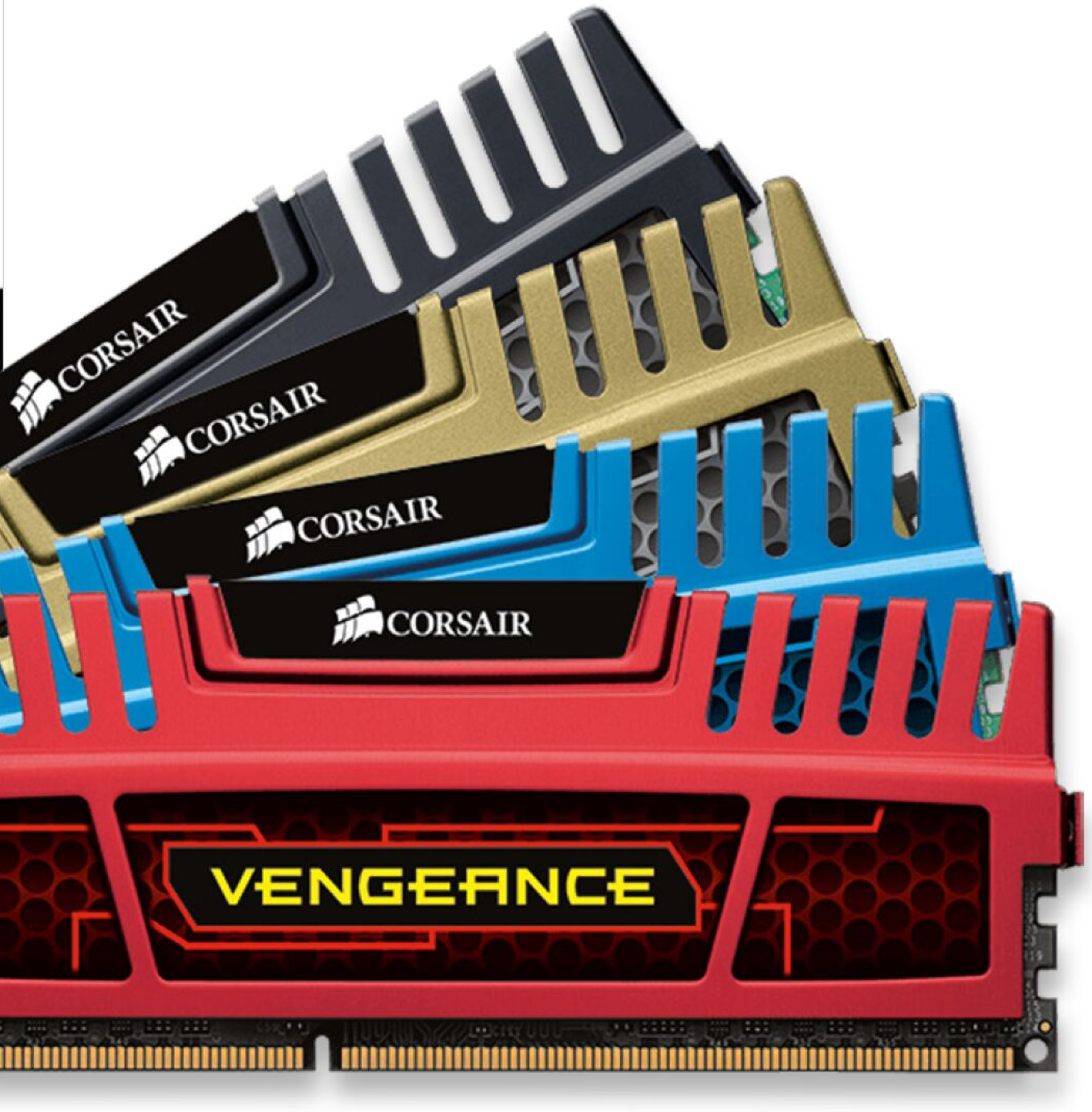
The world's most advanced DRAM

Designed for overclockers and serious gamers

Fast, compatible and reliable

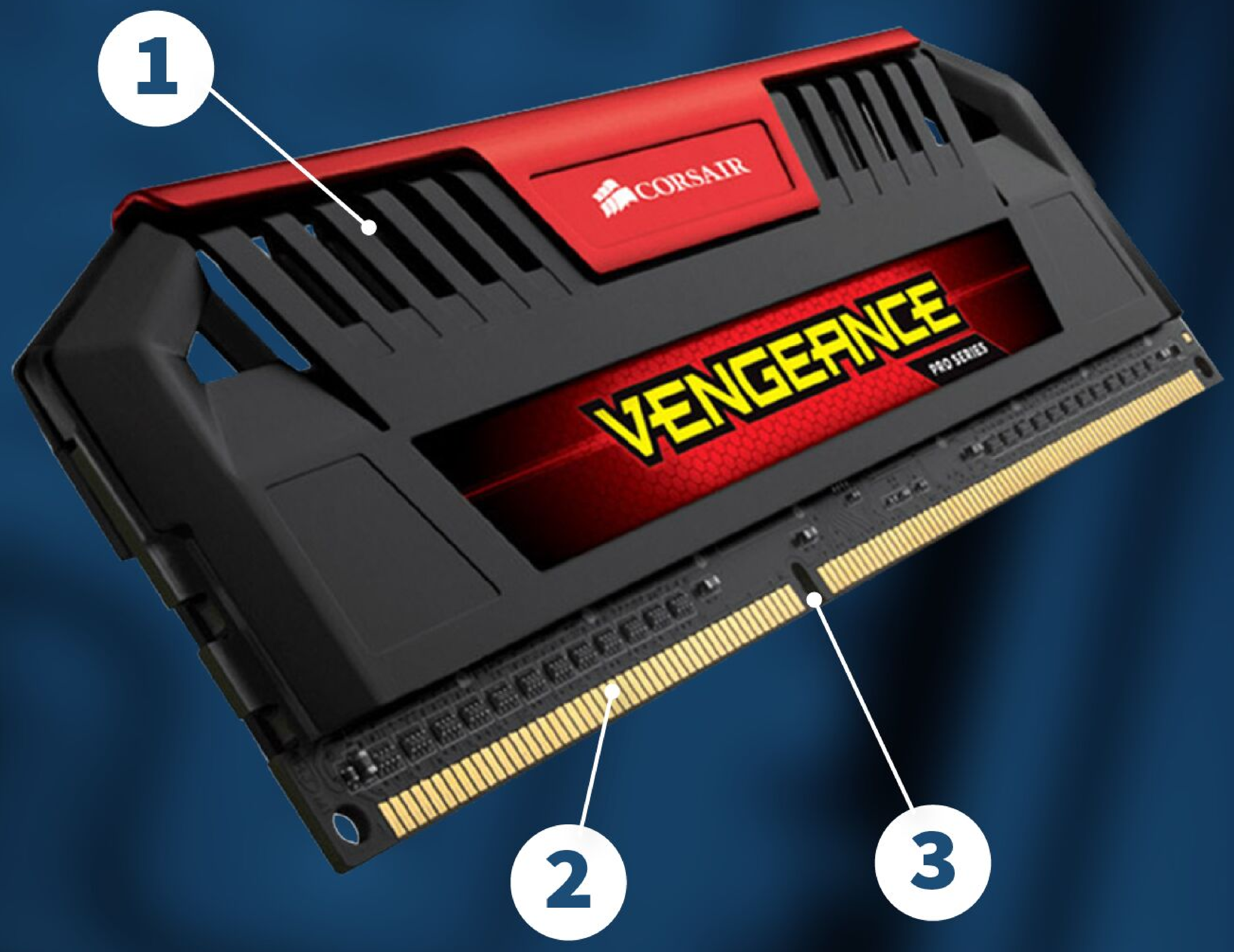
The smart performance upgrade for portable Windows and Mac systems

"[Vengeance LPX] eclipsed our previous champ when it came to over clocking..."
Hardware Canucks


CORSAIR
CORSAIR
CORSAIR
CORSAIR
VENGEANCE

Memory Modules – A Closer Look

A memory module is another name for a RAM chip. It is often used as a general term used to describe SIMM, DIMM, and SO-DIMM memory. Whilst there are several different types of memory modules available, they all serve the same purpose and that is storing temporary data while the computer is running.



1 HEAT SPREADER

Many memory modules now feature heat spreaders, designed to help dissipate heat as the memory is put under load. The design of the heat spreaders varies greatly, with some featuring fins and vents. You can even buy memory modules with built-in LEDs.

2 SOCKET CONTACTS

These are the parts that connect the memory module to the motherboard socket. You should try to avoid touching the contacts during installation but if they are dirty of dusty, it is safe to carefully wipe them with a dry finger (after ensuring you have earthed yourself).

3 ALIGNMENT SLOT

This cutout is a feature of all current memory modules. It is slightly offset from the middle, allowing you to use it as a guide for fitting the module into the motherboard socket. DIMM's will only install one way and the slot prevents mistakes.

THE MEMORY IN OUR BUILD |

As we wanted our build to be able to handle a variety of tasks, we went for some fairly high performance SDRAM. Vengeance LPX memory is designed for high performance overclocking. The heat spreader is made of pure aluminium for faster heat dissipation and the eight layer PCB helps manage heat and provides superior overclocking headroom.

The DDR4 form factor is optimised for the latest Intel X99 and 100 Series motherboards and offers higher frequencies, greater bandwidth and lower power consumption than DDR3 modules. There's XMP 2.0 support for trouble-free automatic overclocking and, the modules are available in multiple colours to match your motherboard, your components or just your style.

Technical Specifications:
- **Density: 16GB (2x8GB)**
- **Speed: 2133MHz**
- **Tested Latency: 13-15-15-28**
- **Voltage: 1.2V**
- **Format: Unbuffered DIMM**
- **Pin Out: 288 Pin**
- **Intel XMP 2.0**
- **Heat spreader: anodised aluminium**

CORSAIR
CORSAIR

HDD, SSD or Both?

The storage capacity of your PC will be dictated by what you will be doing with it but even if you don't think you will need much storage, the cost of storage has come down so much in recent years that it makes sense to choose more than you might need right now. The bigger question with storage these days is whether to go for a HDD, an SSD or perhaps both. Let's take a look at the pros and cons of all these component choices.

SEAGATE
Desktop
SSHD

START BUILDING

Hard Drive: Seagate 2TB Desktop SSHD
Build: Turn to page 72 to start installing your CPU

Making Your Choice

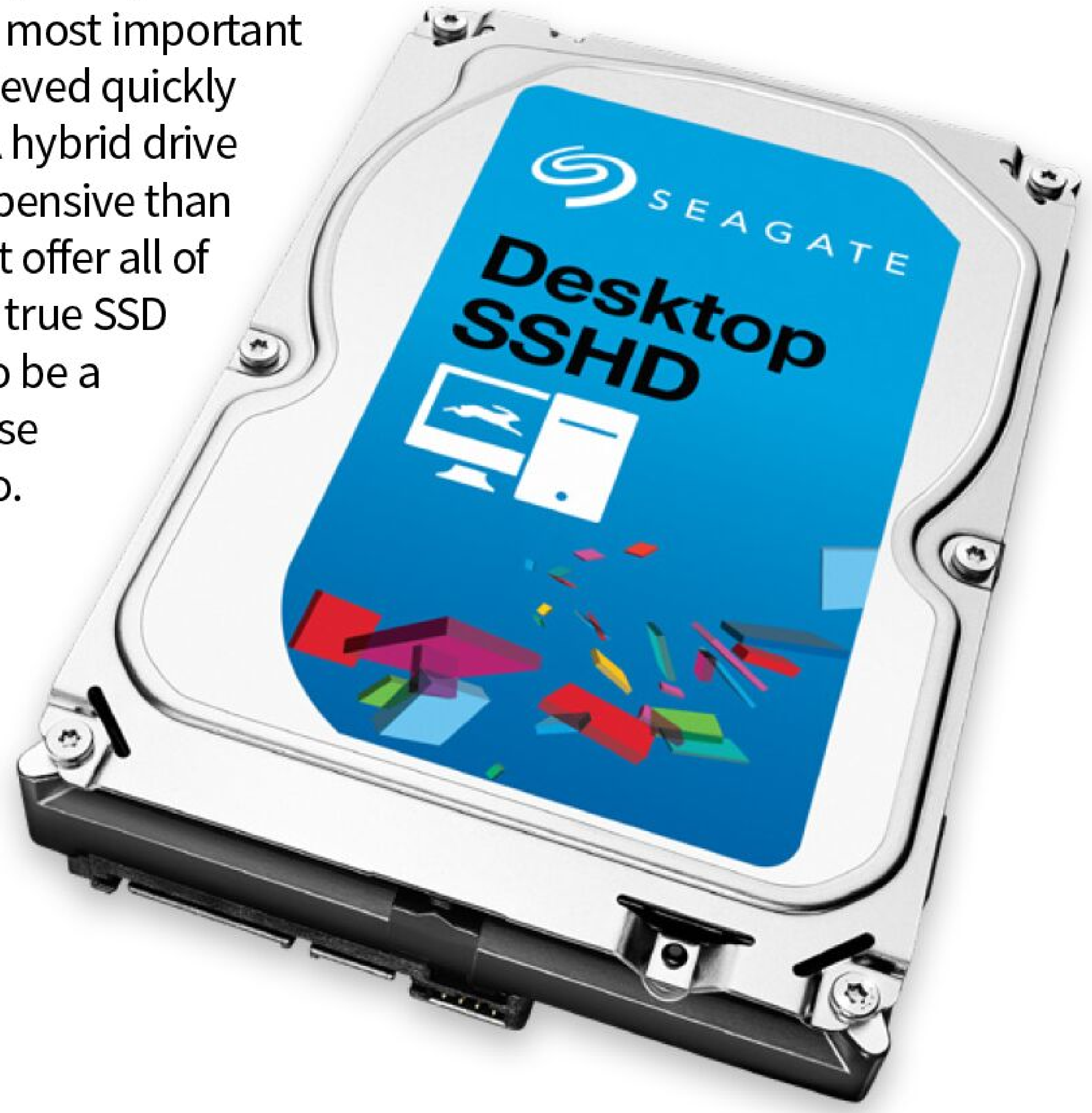
It is very likely that in a couple of years, Solid State Drives (SSDs) will be cheap enough to completely replace Hard Disk Drives (HDDs) but for most PC builders now, a compromise will need to be made between cost and storage capacity.

HARD DISK DRIVES

Standard hard disk drives work by writing data onto a stack of spinning discs within the case of the drive. These spin at certain maximum speeds and the faster the spin speed (RPM), the faster the data is written to and read from the discs. Most currently available HDDs work at a maximum of 7200rpm, but both slower (5400rpm) and faster (10000rpm) are available. A HDD is always the cheapest mass storage option for a PC build but it isn't the fastest, nor the most efficient. Unless you need, for whatever reason, super quick read/write speeds, a SATA connected 7200rpm hard disk drive will be fine for first time builders.

HYBRID SSHD

A more recent option, and the one we have chosen for our build, is a hybrid drive or SSHD. This combines a traditional HDD with a small amount of solid state memory. The SSHD can potentially improve performance as the SSD part of the drive is a cache for the data that is most frequently used, such as for booting and the most important data can be retrieved quickly and efficiently. A hybrid drive are still more expensive than a HDD and won't offer all of the features of a true SSD but they seem to be a good compromise between the two.



SOLID STATE DRIVES

Solid state drives (SSDs) differ from hard disk drives in that they do not contain moving parts, i.e. the stack of discs or platters, and store data on integrated circuit assemblies. There is no "spin-up" time, so data transfer is faster, with less latency. They are great when building a PC that needs to be quiet, as their operation is virtually silent. The downside of them, as with almost all upgraded technology, is the cost. As an example, a 1TB SSD will cost about 4 times as much as a 1TB HDD. There are SSDs available from 64GB right up to 3 or 4 TB.

SanDisk
SSD PLUS
Solid State Drive
SanDisk

BOTH HDD AND SSD

The last and possibly best option is to install both a HDD and an SSD separately within a PC system. This gives you the freedom to have a large amount of storage (at a reasonable cost) but install programs and data which need or benefit from faster access onto a smaller SSD. This is a little more complicated to set up than any of the previous options but you end up with a faster system that has lots of storage. You could buy a 240GB SSD fairly cheaply and combine that with a 750GB or 1TB HDD for example. This would probably cost about half that of a single 1TB SSD.

Hard Disk Drives vs Solid State Drives

Aside from cost, SSDs are more appealing to PC builders in almost every single way. The table below shows how the two types of storage drive compare in a variety of ways.

Seagate
Barracuda
1000GB
www.seagate.com
Solid State Drive
SanDisk

	Hard Disk Drive	Solid State Drive
Start Up Time	Disk spin-up may take several seconds. A system with many drives may need to stagger spin-up, taking even longer.	Almost instantaneous, no mechanical components to prepare.
Random Access Time	Ranges from 2.9 (high-end server drive) to 12 ms (laptop HDD) due to the need to move the heads and wait for the data to rotate under the read/write head.	Typically under 0.1 ms. As data can be retrieved directly from various locations of the flash memory, access time is usually not a big performance bottleneck.
Data Transfer Rate	Once the head is positioned, when reading or writing a continuous track, a modern HDD can transfer data at about 200 MB/s.	In consumer products the maximum transfer rate typically ranges from about 200 MB/s to 1500 MB/s, depending on the disk.
Read Latency	Much higher than SSDs. Read time is different for every seek.	Generally low because the data can be read directly from any location.
Read Performance	If data from different areas of the platter must be accessed, as with fragmented files, response times will be increased.	Read performance does not change based on where data is stored on an SSD.
Noise Level	HDDs have moving parts (heads, actuator and spindle motor) and make characteristic sounds of whirring and clicking; noise levels vary between models but can be significant.	SSDs have no moving parts and therefore are basically silent, although on some low-grade SSDs, high pitch noise from the high voltage generator (for erasing blocks) may occur.
Installation and Mounting	Should be mounted to protect against vibration and shock. Some HDDs should not be installed in a tilted position.	Not sensitive to orientation, vibration, or shock. Usually no exposed circuitry.
Reliability and Longevity	HDDs have moving parts and are subject to potential mechanical failures from the resulting wear and tear. The storage medium itself (magnetic platter) does not essentially degrade from read and write operations. Expect between 6 and 11 years of use.	SSDs have no moving parts to fail mechanically. Each block of a flash-based SSD can only be erased and therefore written a limited number of times before it fails. The controllers manage this limitation so that drives can last for many years under normal use.

NAND FLASH |

As of 2016, most SSDs use MLC NAND-based flash memory; this is a type of non-volatile memory that retains data when power is lost. For applications requiring fast access but not necessarily data persistence after power loss, SSDs may be constructed from random-access memory (RAM). Such devices may employ batteries as integrated power sources to retain data for a certain amount of time after external power is lost.

SSD RAID ARRAYS |

Since SSDs are currently generally of smaller capacity than HDDs, one solution to increase your storage capacity while still enjoying the speed and durability benefits of solid state technology is to use a RAID array. RAID stands for redundant array of independent disks (sometimes inexpensive disks) and is a way of making Windows tie several SSDs together and treat them as one single drive. This has many advantages, not least because the read and write times of a RAID array are frequently faster than for a single drive. Setting up a RAID array is not too difficult. For now, if you'd like to know more visit https://support.microsoft.com/en-us/kb/100110.

HDD FORM FACTORS |

The benefit of using a current HDD form factor would be to take advantage of the extensive infrastructure already in place to mount and connect the drives to the system. These traditional form factors are known by the size of the rotating media, e.g. 5.25-inch, 3.5-inch, 2.5-inch, 1.8-inch, not by the dimensions of the drive casing.

WHAT IS NAS? |

Network Attached Storage (NAS) allows multiple users to store and share files in a centralised location rather than individuals storing files on their own computers. By using Network Attached Storage, documents, reports, music and videos can be shared with anyone who has access to the network.

Think of NAS as a standalone hard drive that can be connected to all the computers in the home or business. This network of users can then store and access files on the NAS so that anyone can retrieve them. For businesses this makes data management so much simpler especially when a team is working on a joint project. Documents and other digital media no longer need to be emailed around the office but can be easily placed on the NAS for sharing.

A huge plus point in favour of Network Attached Storage is that it is possible to set up remote access. Forgotten that report you needed to work on at home? No problem. Just remotely log into NAS and retrieve the file.

Choosing a Graphics Card (GPU)

If you are building a PC to be able to play games, the graphics card or Graphical Processing Unit (GPU) will probably be one of the most expensive components after the CPU. GPUs seem to be improved and updated at a faster pace than almost any other item you will fit into your computer and keeping up with the latest cutting edge tech can be very expensive. For our build we have chosen a card which offers a good mix of features and at a reasonable price.

START BUILDING

GPU: Sapphire Nitro Radeon R9 380 4 GB
Build: Turn to page 76 to start installing your graphics card

SAPPHIRE
NITRO R7 370
Radeon™ Graphic Accelerator
Nitrocharged for gamers.
SAPPHIRE
NITRO
OVERCLOCK
SAPPHIRE
AMD
RADEON
R7 SERIES
DUAL-X
Cooling
Made for
Online Gaming
Intelligent
Fan Control
RADEON R7 370
Radeon™ Graphic Accelerator
NITRO

Making Your Choice

Choosing a graphics card can be a very confusing business. For a start, there is the naming system, which is distinctly unintuitive, then there are the power and performance statistics to get your head around. Hopefully this guide will make your choice easier.

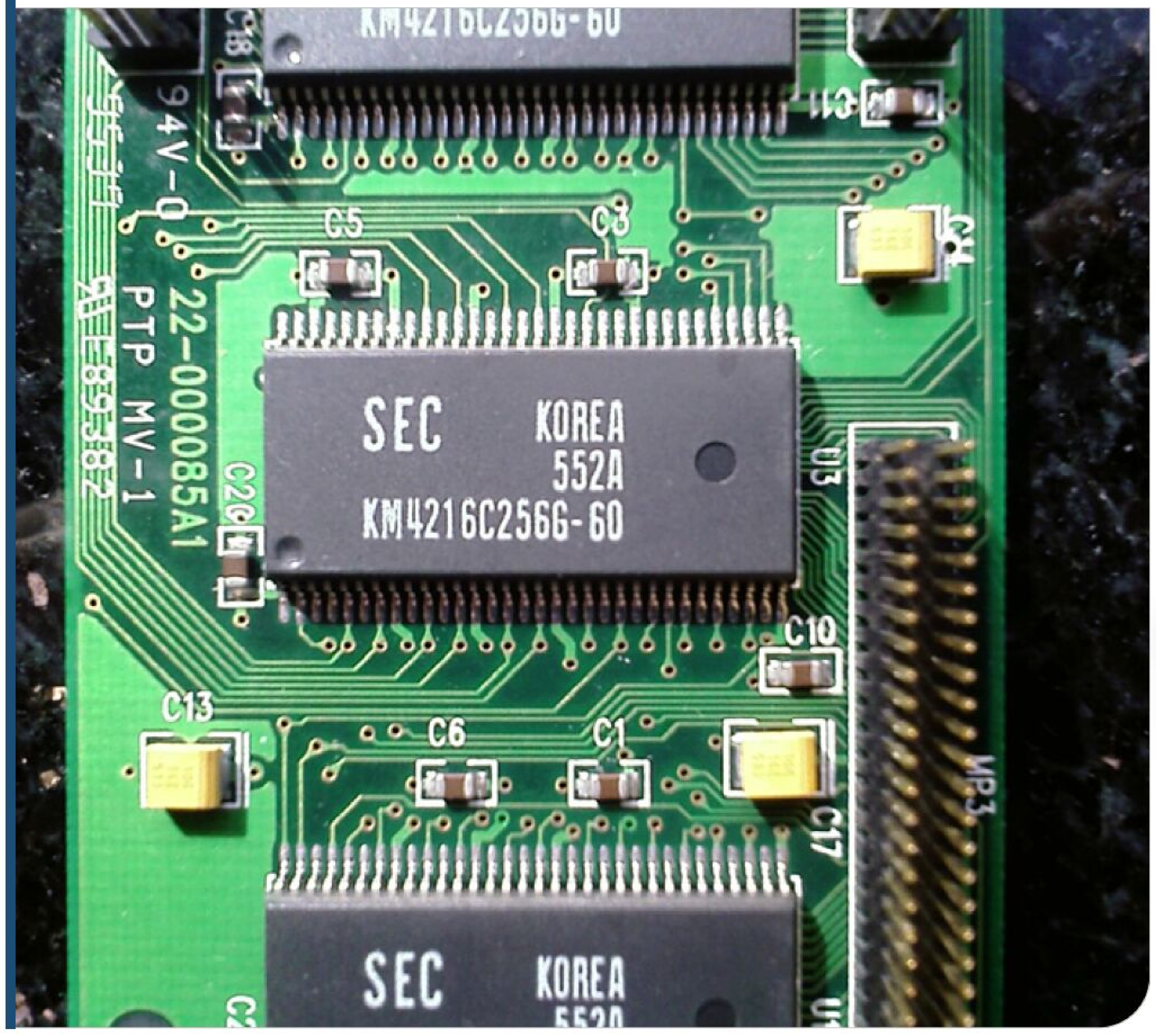
NVIDIA OR AMD

Although there used to be a few other options when it came to graphics card chip makers, the choice is now between just two, Nvidia and AMD. This is a continual arms race, with each improved card from one camp being bettered by an upgraded card from the other camp just weeks or months later. For the average gamer or indeed the average PC user, there is little to choose between them. If you are a hardcore gamer who wants to drop a couple of weeks wages on a cutting edge card, Nvidia is probably the way to go right now, with their incredibly powerful GTX 1080 architecture.

AMD

VIDEO MEMORY (VRAM)

Although you should aim to buy a graphics card which offers the most on-board RAM for your buck, the amount isn't the only consideration. A card with 2GB of GDDR5 RAM is probably a better option than a similarly priced card with 4GB of GDDR3 RAM. It is currently possible to buy graphics cards with 8GB of GDDR5X RAM, which is the newest version of VRAM available, and costs a quite staggering amount of memory. You will of course, pay a premium for this sort of card specification. As a minimum, look for at least 2GB of GDDR5 RAM on a graphics card.

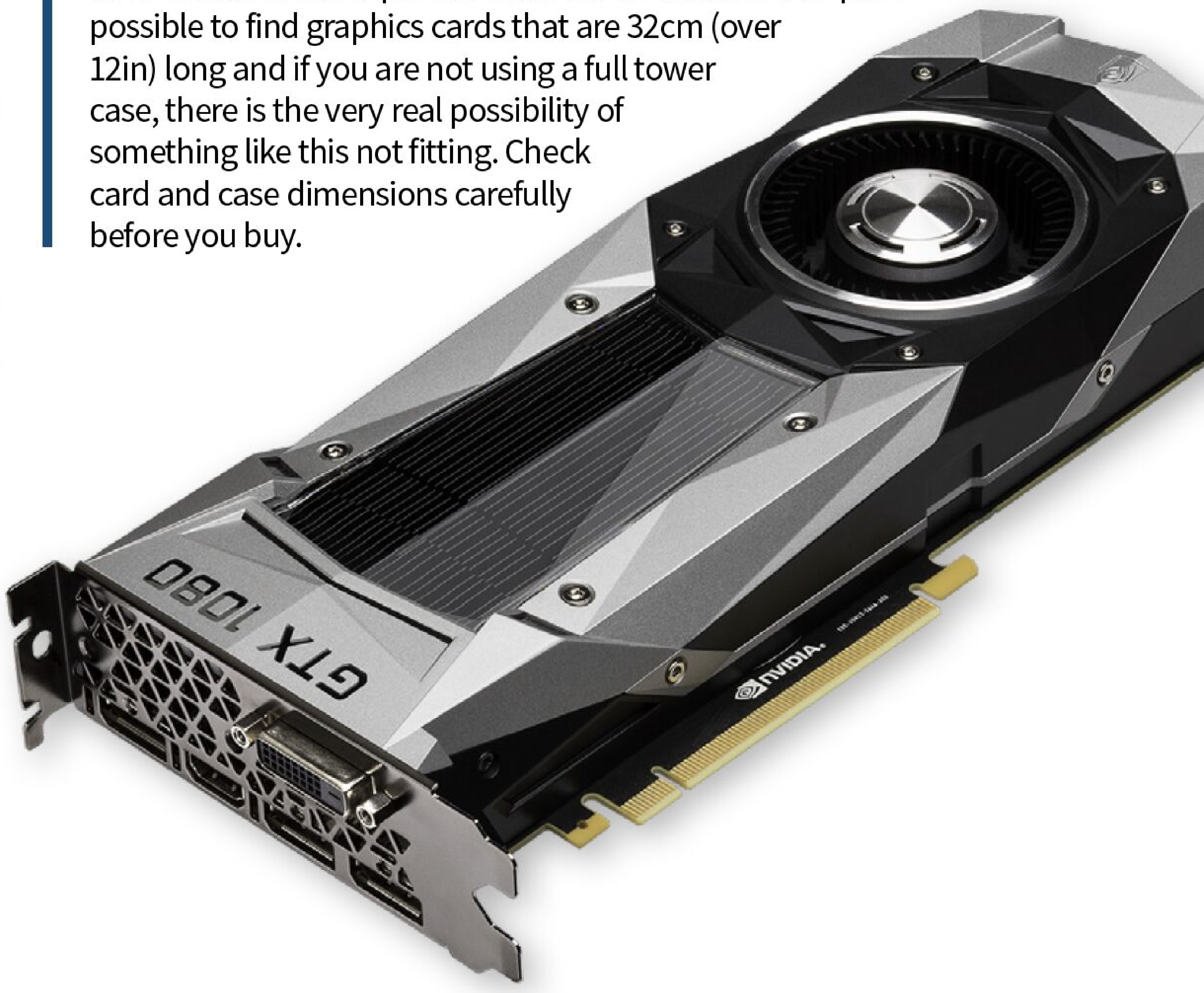


CLOCK SPEED AND MEMORY BUS

Although there are dozens of different specs to look at when choosing a graphics card, graphics core clock speed and the size of the memory bus along with the amount of VRAM, are probably the most important for gamers. The core clock speed tells you how fast the GPU can work, whilst the memory bus size (256-bit is a good size to look for) controls how much data can be sent through at once. A card with a clock speed of 1000MHz and a memory bus of 256-bit, is probably a better choice than one with a clock speed of 1200MHz but a memory bus of 128-bit. Don't base your choice solely on these three specs but they are a good place to start comparing.

PHYSICAL SIZE

Finding the perfect graphics card to run your favourite games is all well and good but if that card won't physically fit inside your case, you have a big problem. Graphics cards not fitting is a fairly new problem, unless you were trying to build a LAN box or other small, custom set up. But these days, even midi tower cases can struggle to house some of the triple-fan cards on the market. It is quite possible to find graphics cards that are 32cm (over 12in) long and if you are not using a full tower case, there is the very real possibility of something like this not fitting. Check card and case dimensions carefully before you buy.



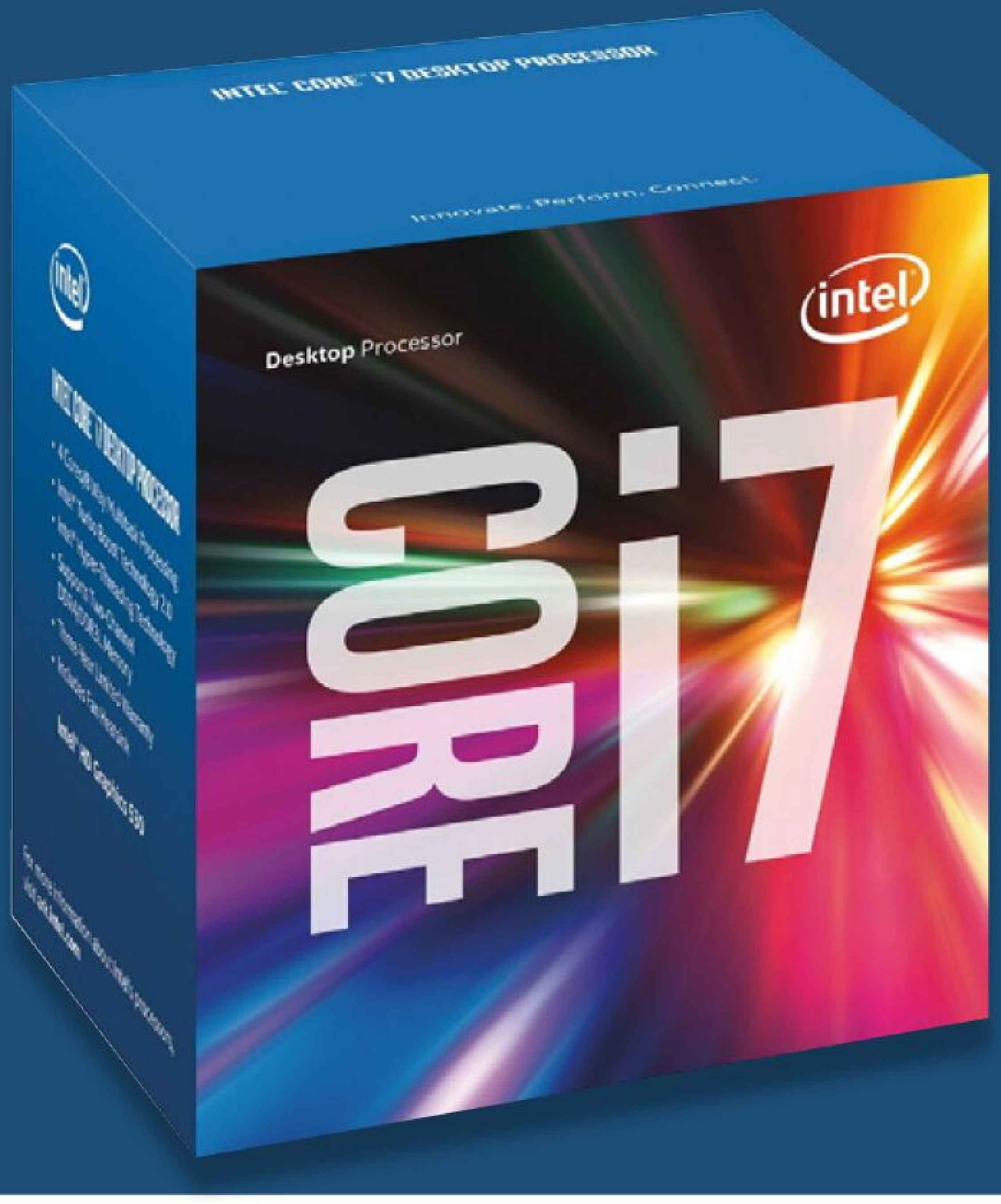
MODEL NUMBERS |

The world of graphics cards is dominated by model numbers. By model number we mean, as examples, the Radeon **R9 380X** or Geforce **GTX 780 Ti**. It is one of the easiest ways to tell if one card will be more powerful than another from the same family, i.e. AMD or Nvidia. Graphics cards normally change model number when there is a significant increase in clock rate and memory bandwidth or with a newer generation of the GPU itself. So a high-end Radeon **R9 380** may not be as fast as a basic Radeon **R9 390**. As a general rule, go for a card from the newest generation you can afford but always compare the specification we talked about above first.

msi
R9 380
GAMING 4G

POWER ON DEMAND |

If you are going for a high-end graphics card, you will need to consider the problem of the increased power it will need. As a general rule of thumb, if you assume that each graphics card requires a maximum of around 250W and that a regular system also uses around 250W. This will vary based on the components you are using. This means that for any modern gaming PC you will want around 600W as a minimum and it's always best to have around 100W in reserve. Most graphics card manufactures will list the wattage used (as TDP) so you can do the calculation yourself.



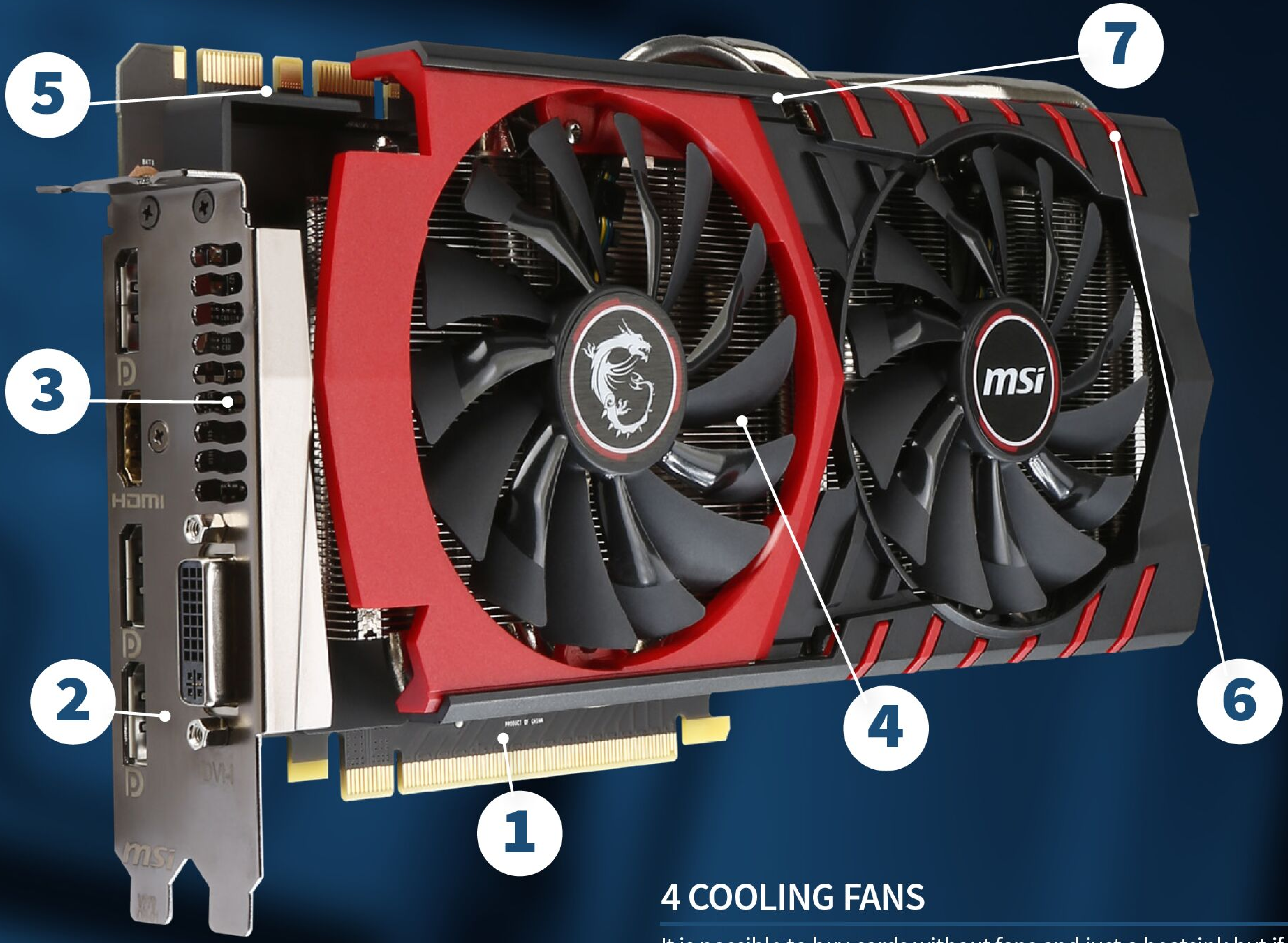
SLI AND CROSSFIRE |

Both Nvidia and AMD offer a feature that allows two graphics cards to be run side-by-side within a single system (CrossFire for AMD cards and SLI on Nvidia cards) but before you consider doubling up on the GPU, you should understand the limitations of doing so. It sounds like a great idea but scaling graphical performance by doubling GPUs is not as smooth a proposition as it might seem. A second graphics card does not increase performance by a factor of two; it's more realistic to expect a 25-50 per cent increase.

It also requires a lot of power to run two cards, so your PSU is going to cost more. Not all power supply units even feature two PCIe cables. There are other problems too, including the possibility of inconsistent performance, incompatibilities and lots of noise. For a first time PC builder, we would recommend avoiding this option and instead spending the extra money on a better single card.

Anatomy of a graphics card

Modern graphics cards can be expensive and slightly intimidating bits of kit. Let's take a look at the standard parts of a high-end card, to help you feel more comfortable handling one.



1 PCIE CONNECTOR

Running along the bottom of the card is the connector for the PCIe x16 socket on your motherboard. PCIe is now the standard, replacing AGP or Advanced Graphics Port several years ago. This must be firmly seated into the motherboard and will be held in place by a clip or slide on the socket. The cut out helps to line it up correctly.

2 OUTPUT PORTS

You will need to remove one, or more likely two, blanking plates from the back of your case (the expansion slots) to allow for the external plate to fit. This is where you connect your monitor to the graphics card and will usually feature DVI and HDMI but may also include DisplayPort and other outputs.

3 EXHAUST VENT

This exhaust vent, again on the externally facing plate, helps to get some of the massive amounts of heat generated by a card like this out of the case. Not all cards will have this vent but many of the more powerful cards will. Check this is not blocked regularly.

4 COOLING FANS

It is possible to buy cards without fans and just a heatsink but if you want a high-performance card you are going to have to expect anything from one to three cooling fans to be whirring away inside your case. Without these, the chip could overheat and die in a matter of minutes.

5 CROSSFIRE CONNECTOR

Not all cards have this, or may have a slightly different CrossFire connector if using AMD, but on this card, the SLI connector is on the top edge. If your card is SLI (or CrossFire) compatible, you will often get the small connector bridges along with the card itself.

6 POWER SUPPLY PORT

You cannot see it on this card but there will be a power input connector on almost every graphics card you buy nowadays. The amount of power a card needs can vary, as can the type of power connector. This card, the MSI Geforce GTX 1080, requires a 6-pin and 8-pin connector.

7 SPEED CONTROLLER SWITCH

This switch cannot be seen on this card and not all cards will have one but many have a tiny speed controller switch for the fans. The card will still decide the fan speed needed but you can control the controller if there is generally more or less airflow.

Need More Power?

The role of a PC power supply unit is to convert the AC electric power that comes from the mains to the DC power that the computer requires. However, it can do much more than that. A good quality power supply can make your system more efficient, stable and reliable. The power supply is often the first component to fail in an older system, so making sure you understand the full role of the PSU in your build is very important.

START BUILDING

PSU: Aerocool Integrator 700W
Build: Turn to page 78 to start preparing your PC case

Making Your Choice

As with any purchase, there are several things you need to consider before you choose a power supply. Getting things wrong here could mean a difficult build or additional expense later.

PC POWER REQUIREMENTS

The first thing to consider is exactly how much power your PC build will require as a minimum. The exact power requirement will vary depending on the components you have chosen. If you are using a 4GHz i7 processor and an Nvidia GTX 1080 graphics card, you will need to look for a PSU with a higher wattage than if you are using a 3.2GHz i5 and a GTX 750. As a basic rule of thumb, add up the power requirements for CPU, GPU and HDD; you can find this in the documentation or on the manufacturer's website. Then add on 250W, which is the average power requirement of a base system, and finally add on 100W.

POWER CONNECTORS

The selection of power connectors your chosen PSU has is more of a concern if you are using a wired unit. The main things to check are whether it has the correct connector for the CPU power socket (4 or 8-pin) and that it has the correct connections for your chosen graphics card. Many modern graphics cards will need two PCIe power connections and they could be either 6 or 8-pin, and even one of each. You will normally have a lot more options with a modular PSU but even if you buy a wired power supply with the wrong connectors, you might be able to buy an adaptor.

CORSAIR
HX650

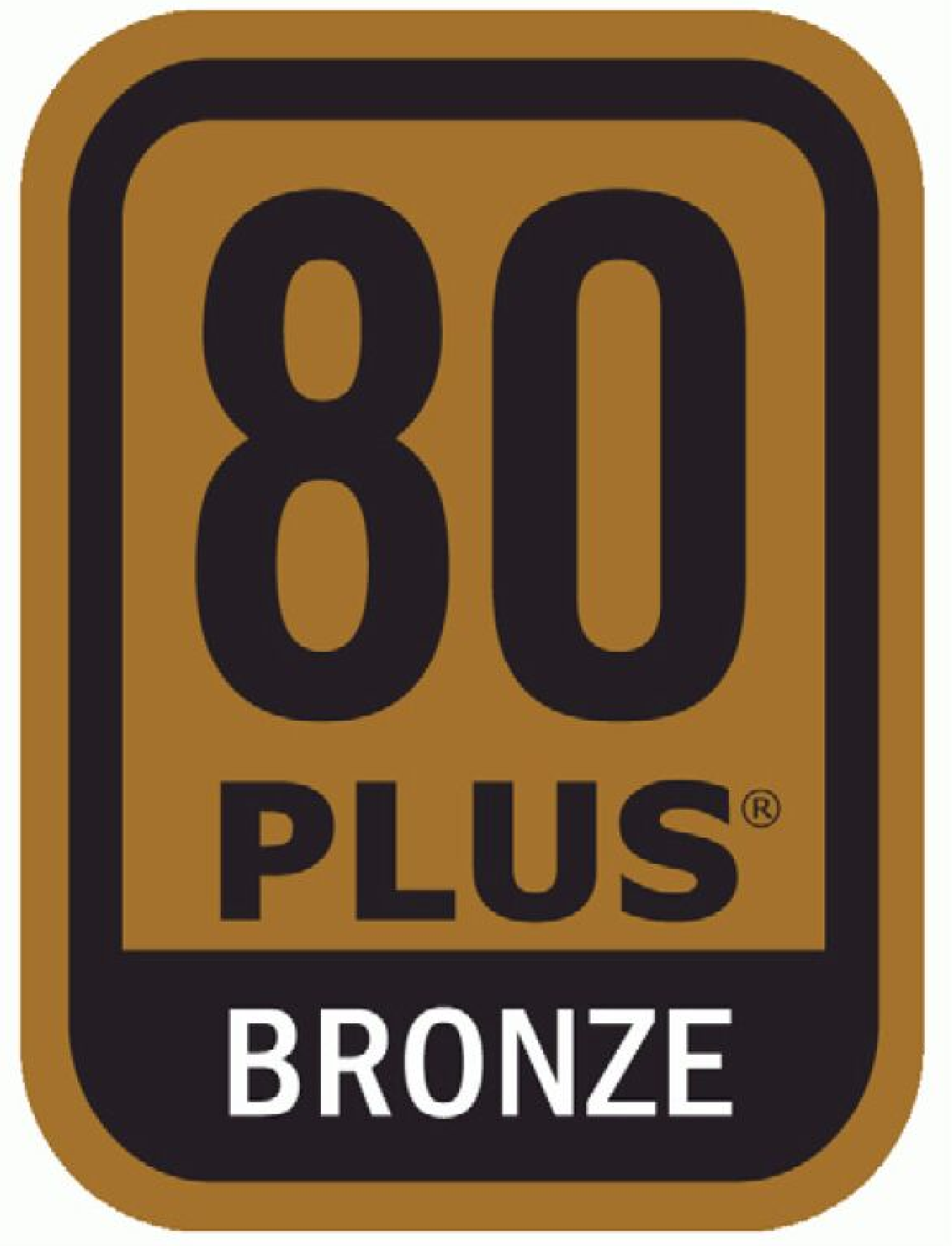
WIRED OR MODULAR

A modular power supply is simply one that has the cables separate to the main unit. This allows the end user to pick and choose the exact cables they need to attach (a large selection will be supplied with the PSU) and avoid the problem of excess cables. A modular power supply is usually more expensive than a wired counterpart, although this is usually down to the convenience it will offer rather than build quality. You can also buy semi-modular PSUs, which have the main power cable wired in and then several ports for connecting other cables.

CORSAIR
AX860i

POWER EFFICIENCY

It's not all about the wattage of a power supply. Efficiency is also important, although probably less so if you are on a tight budget, so look for PSUs that have the 80 Plus certification. This indicates that the PSU will be 80 per cent or more energy efficient. This type of power supply saves money by wasting less power; as a result they use less electricity and also emit less heat. The benefits of using an efficient power supply are more substantial in computers that use a lot of power.

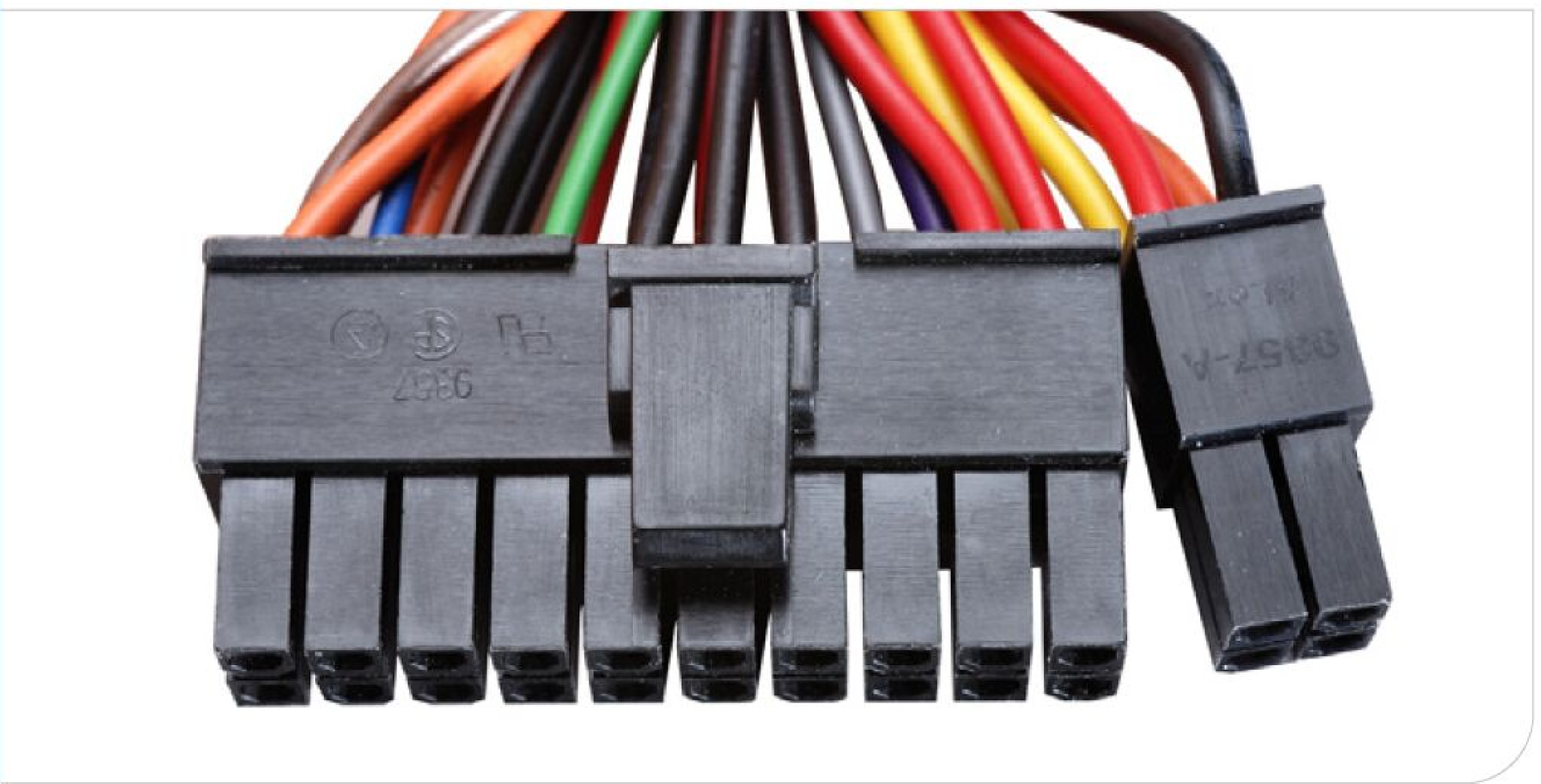


Power Connections

The following are the power connectors that our build requires. Although this is a good example of a standard set of connections, you should always check your build doesn't need different ones.

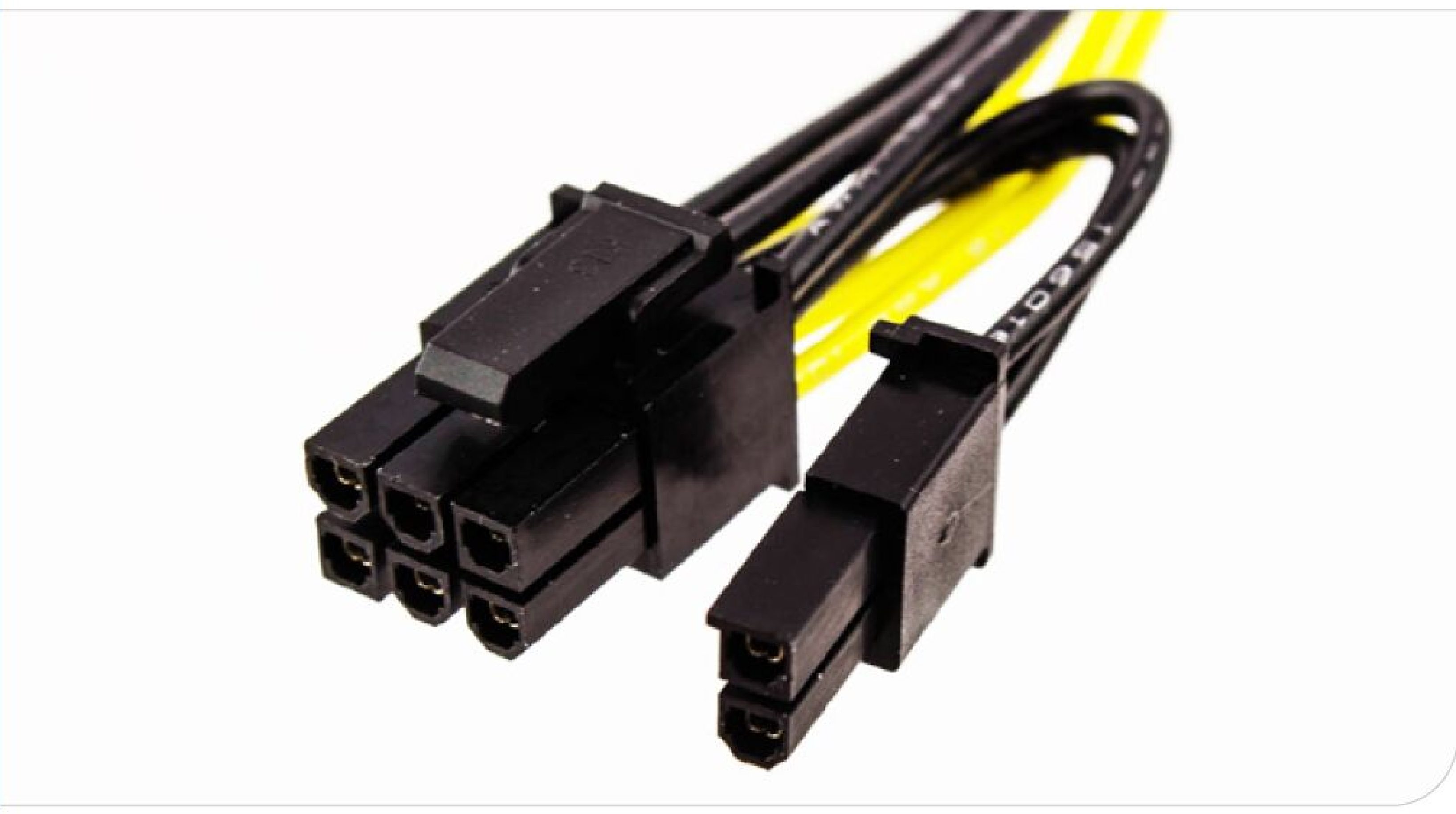
THE 20+4 PIN CONNECTOR

This is the main power connector for the motherboard, providing power for most of the on-board features. If you are using an ATX or mATX motherboard, you will need to use all 24 pins. Some motherboards will only need the 20 pin part so check with your motherboard manual or manufacturers website. Ensure it is lined up correctly and press it home, supporting the board as you do this.



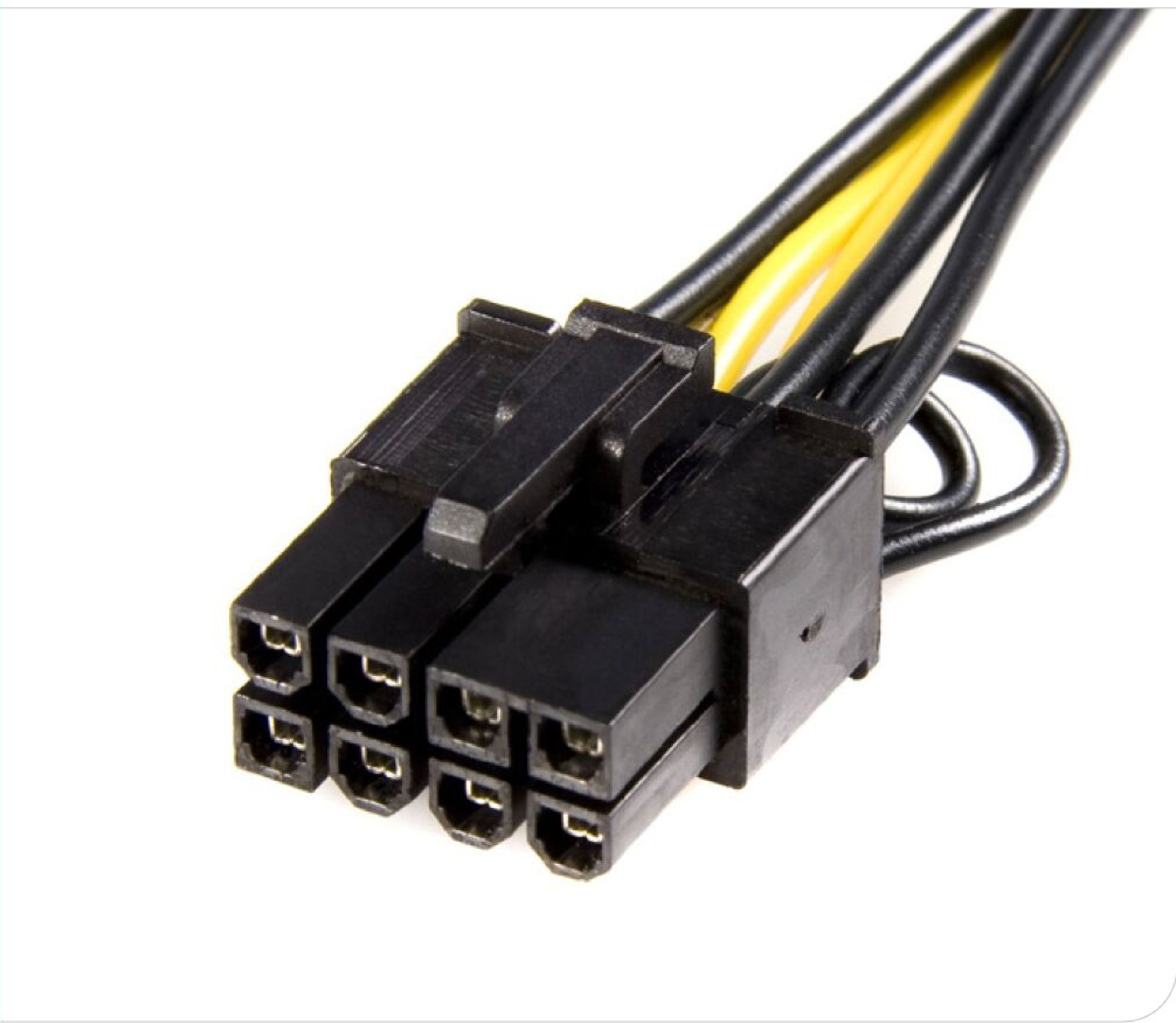
THE PCIE 6 PIN CONNECTOR

This cable is for providing dedicated power to your GPU (graphics card). Older cards were able to draw power from the motherboard but almost all modern GFX cards will need their own supply. The PCIe connector is normally an 8-pin, that can split into a 6 plus a 2-pin. In our build the Radeon R9 card requires two 6-pin connections, which we were careful to ensure our PSU had.



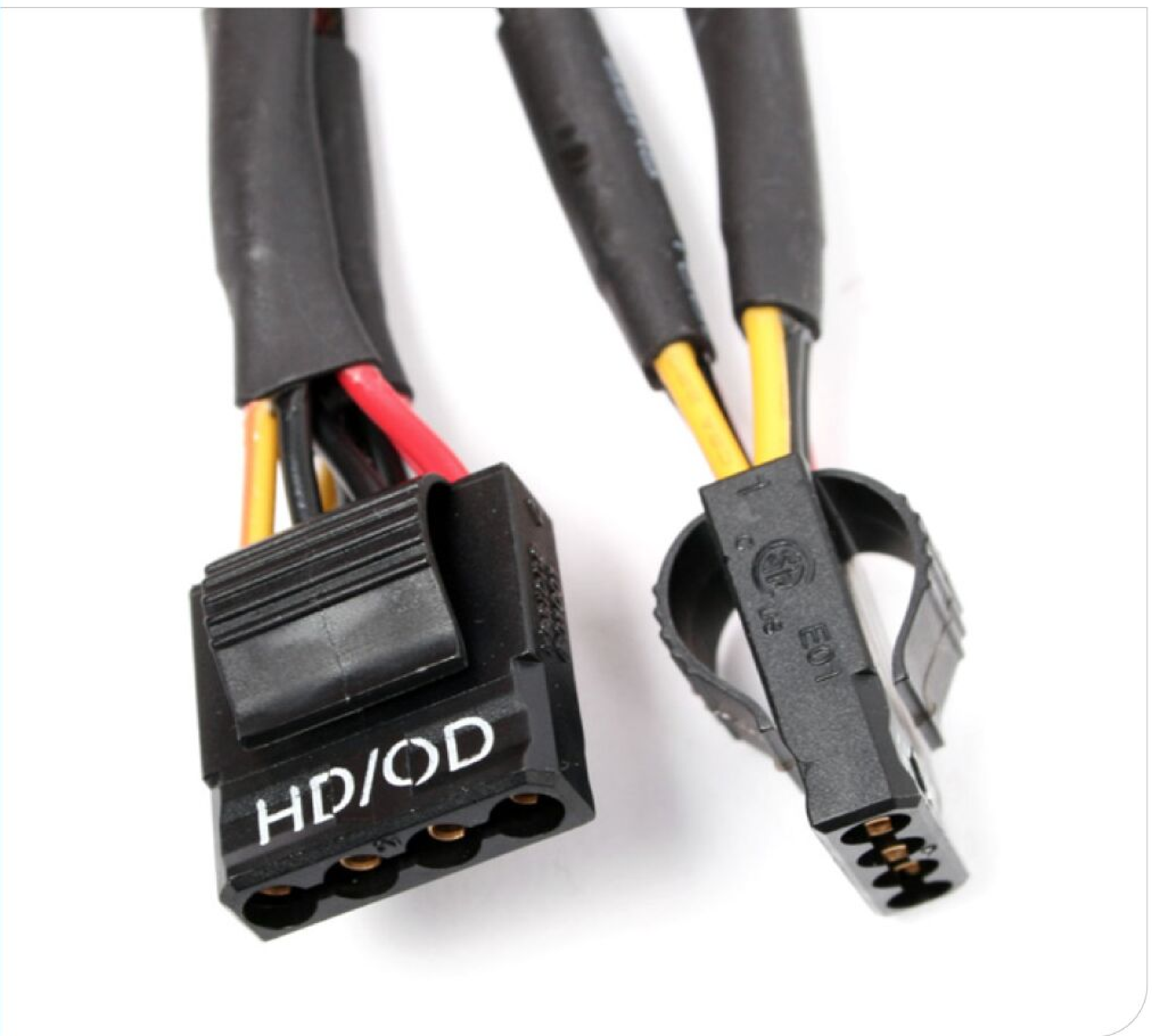
THE 4+4 PIN CONNECTOR

This is the power for the processor only and on modern motherboards which have modern CPUs, this will be an 8-pin connector that can split into two 4-pin connectors. If your motherboard or CPU only require a 4-pin 12v connection, just use either of the two. In some cases the PSU will only have a single 4-pin 12v connector. As before, line up the pins and press firmly into place.



THE MOLEX CONNECTOR

Almost universally known as Molex, these connectors were widely used in older PCs to provide power to hard drives, CD drives, etc. but have now been almost totally replaced by SATA connectors. You will almost certainly still see a couple of Molex connectors if you are using a wired PSU. On a modular PSU, you can simply leave them in the box if they are not required.



THE SATA CONNECTORS

This kind of plug is used to provide power to Serial ATA (SATA) devices such as hard disk drives and optical disk drives. If your power supply doesn't have enough of these plugs for your system, you can convert any standard peripheral power plug (known as Molex) into a SATA power plug through the use of an adapter. SATA connectors are often daisy-chained on the same cable.

WM 1007 18AWG

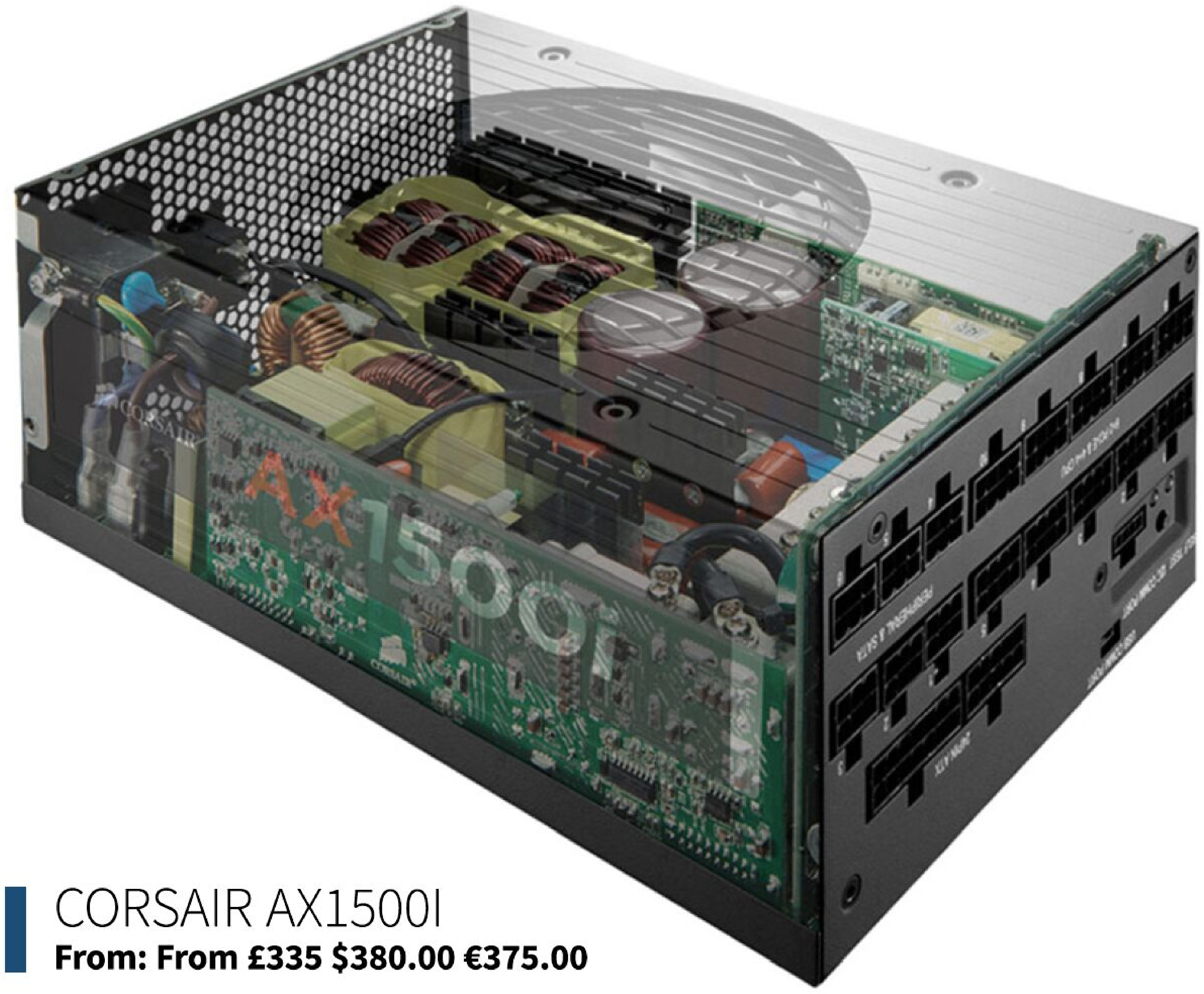
MODULAR PSU

A modular power supply provides a detachable cable system, offering the ability to remove unused connections at the expense of a small amount of extra electrical resistance introduced by the additional connector. This reduces clutter, removes the risk of dangling cables interfering with other components and can improve case airflow. Many modular supplies have some permanent multi-wire cables with connectors at the ends, such as PC main and four-pin Molex, although newer supplies marketed as "Fully Modular" allow even these to be disconnected.

CORSAIR
AX1500i

High Performance PSU

As with any of the components in your build, it is possible to spend large amounts of cash to get very high performance power supply units. One such PSU is the Corsair AX1500i Digital ATX Power Supply Unit. It provides 1500 Watts of continuous, digitally controlled power on 15 Amp circuits of 115V or higher; and 80 PLUS certification with an incredible 94 per cent efficiency rating. Zero RPM Fan mode ensures silent operation at low and medium loads and the fully modular, low profile cable set makes for easy installation and great looking builds. Corsair Link integration lets you monitor power usage and efficiency and customise performance, directly from your Windows desktop.



CORSAIR AX1500I

From: From £335 $380.00 €375.00

EFFICIENCY RATINGS EXPLAINED

There is a considerable difference between the lowest and highest efficiency ratings you will find on power supply units. It effects not only how much power your PC will use, but how well that power is distributed to components.

80 PLUS® TITANIUM

80 PLUS® PLATINUM

80 PLUS® GOLD

80 PLUS® SILVER

80 PLUS® BRONZE

Do You Need an Optical Drive?

Building a PC a few years ago without an optical drive would have seemed like madness. It would have made using the PC fairly difficult as most software was supplied on discs and Internet speeds were not really up to the task of downloading large files such as games. Nowadays, almost everything you might want to install on your PC can be bought electronically and discs are becoming somewhat obsolete. So do you actually need to install a CD/DVD drive?

LITEON
DVD
R/RW
R DL
RW
DVD+R DL
COMPACT
disc
ReWritable
Ultra Speed

START BUILDING

Optical Drive: LiteOn iHAS124 24X DVD Writer
Build: Turn to page 74 to install your optical drive

Making Your Choice

The optical drive is one of the first non-essential components we have looked at in this guide. Deciding whether you need or want one is down to your user requirements.

CD OR DVD DRIVE?

In all honesty, buying a CD writer drive is fairly pointless, seeing as you can burn audio just as easily with a DVD writer that only costs a few pounds extra. CD writers are actually quite hard to find if you like shopping at the large online component retailers. So if you want the ability to burn discs on the PC, pick up a DVD writer drive.

BLU-RAY DRIVES

You can of course, choose to add a Blu-ray drive instead of, or as well as your DVD drive. These drives are still surprisingly expensive, especially if you want one that is a writer drive, considering how long the format has been available. You can expect to pay about £50.00 for a Blu-ray writer drive, compared to around £15.00 for a DVD writer.

LG
Blu-ray Disc
M-DISC
BD-ROM / DVD Rewriter

CASE STYLE

Most DVD writers have black front panels, to blend with the majority of PC cases. If you have a case with a coloured front that doesn't hide drives behind a door panel, you might struggle to find one to match. Some cases with a brightly coloured front panel come with snap on facias for optical drives but you will probably be restricted to certain makes and models.

EXTERNAL DRIVES

The alternative is simply to get an external drive that you can connect to your PC as and when you need it. External DVD writers are slightly more expensive but generally smaller and sleeker and designed to sit on top of a case unobtrusively. They also have the advantage of being fully portable and can often be linked directly to a TV or monitor.

super multi blue
LG
Blu-ray Disc

YOUR DRIVE-LESS PC |

If you do decide to go for a build without an optical drive (you can always add one later of course), you should at least make sure that you have a few things in place. If you are going to be streaming or downloading software, you will need to ensure that your Internet connection is a good speed. It is also worth thinking about storage. If you have software on a disc, you could install and delete it as required to save space on the hard drive; but if you are getting all of your software digitally, you might need extra space to store it. Burned discs are also portable but having a 16/32Gb USB flash drive handy might also be a good idea if you think you may need to move software around.

Expansion Cards and Extras

Expansion cards are technically any printed circuit board that can be added to the system to add functionality or features. This means that a graphics card is an expansion card, albeit a fairly fancy one, and you can run a PC without including one, assuming the motherboard has on-board graphics. Here we will look at some of the other expansion card options you may want or need in your build.

START BUILDING

Expansion Card: None Installed
Build: Learn more about installing an expansion card here

Making Your Choice

Expansion cards, of which a graphics card is one type, are used to add specific functionality to a PC. You might not even know you need one until you understand some of the options available.

DO YOU NEED ONE?

Expansion cards used to be much more prevalent, especially sound cards and LAN cards. This is because motherboards either didn't have these features on-board or the ones that were on the motherboard were basic versions. So if, for example, you wanted 5.1 channel audio on your PC, an expansion card could give it to you. So before you buy an expansion card, other than a graphics card, check that you actually need it.

FAN CONTROLLER

Another additional extra that you may want to think about, especially if you are building a gaming PC that will need good ventilation, is a fan controller panel. These are usually fitted into one of the optical drive slots on the front of the case and will either have dials or buttons to speed up or slow down the internal fans. If you are planning on adding a fan controller, check that your motherboard supports it.

Aerocool
Touch-1000
2100
55
Aero Cool

DO YOU HAVE SPACE?

Unless you are building a Mini ITX PC, it is very likely that you will have several spare PCI sockets for use with expansion cards but it is certainly worth checking that the motherboard you want to use in your build has enough PCI sockets for the amount of expansion cards you plan to add. It is also worth checking that the PCI slots available, will support the cards as there are several different types of PCI socket.

GIGABYTE
USB 3.1
HDMI/DVI
SATA EXPRESS
Ultra Durable
UEFI DualBIOS
Designed in Taipei
G1 GAMING

STORAGE CARD READER

Another useful option for some builders is a card reader hub, which again can be fitted into the front optical drive slots of a case but can also be bought to fit into an expansion slot at the back. These usually feature slots for SD cards, USB flash drives, MicroSD and more. Obviously a front fitted hub is more convenient if you use storage cards regularly but a rear hub is good if your case doesn't have lots of optical drive slots.

M2/MS Micro
XD
SD/SDHC/MiniSD/MMC/RS-MMC
T-Flash/Micro SD
ACT
CF/MD
MS
POW
USB3.0
USB3.0

NETWORK CARDS |

If your motherboard network port is not as fast as you need, a network card could be the answer. The Tenda Gigabit Network Interface Card is easy to use and economical, making it a great choice for you to connect to a Gigabit network. Other options include the Intel Gigabit Pro/1000CT PCIe Desktop Adapter - OEM version, which can enhance network performance and increase end-user productivity.

CPU and Case Cooling

The days of having a single exhaust fan in your PC case and a stock cooler on the CPU are well and truly behind us. It is not unusual to see cases being sold with three, four and even six fans, particularly if you are looking for a gaming enclosure. As components get more powerful, they generally produce more heat and getting that heat away and out of the case is a very important way of protecting your computer.

Freezer Pro 7
www.arctic-cooling.com

START BUILDING

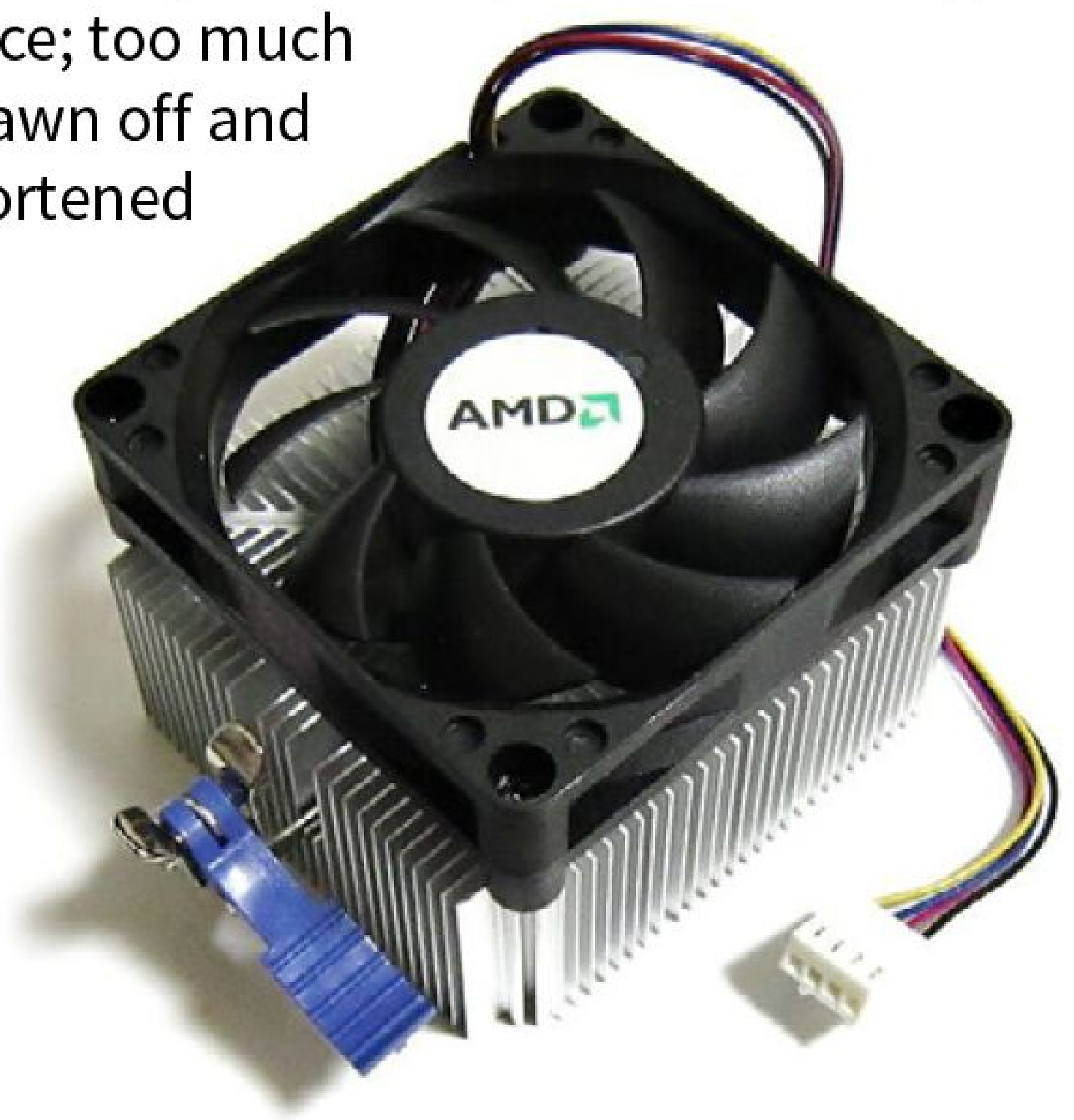
Coolers: Arctic Cooling Freezer 7 Pro and Arctic Cooling F12 120mm Case Fan
Build: Turn to page 64 to install your CPU Cooler

Making Your Choice

Most cases feature at least two fans, and your CPU will be supplied with a stock cooler, but if you want to build this PC properly, you really need to upgrade both of those components.

STOCK COOLER?

A stock cooler, meaning a standard CPU cooler supplied by the chip maker, may be perfectly fine. However, this will depend on the CPU you have chosen and the amount of load you think it might have to deal with. Generally the more powerful the chip, the more heat it will produce; too much heat, that isn't properly drawn off and expelled, could mean a shortened life for the processor. For a fairly small amount of money, an after market CPU cooler could see temperature drops of 10-15 degrees centigrade compared to a stock item.



AIR CPU COOLER

Air coolers, those that use a fan and heatsink to draw heat directly from the CPU, have been the norm in PCs for years. They can be pretty efficient, depending on their specification and they are not very expensive. There is a lot of choice out there but on the downside they are quite big and unless the fan used is high quality, they can add another layer of noise when your PC is running. Any heat drawn off the CPU has to be dealt with by the case fans. It is possible instead to buy CPU water coolers.

WATER CPU COOLER

These work by pumping water in a closed loop between a heatsink attached to the CPU and a radiator. Fans on the radiator cool the water heated by the CPU and pump it back round as cool water, ready to draw off more heat. These are considered much more efficient than the air coolers but are also much more expensive to buy. The cooling radiator is normally positioned so that the fans draw air from outside the case but this often means the case needs specific radiator mounting points.

EXTRA CASE FANS

Whether you need to upgrade the case fans, or add more, depends on your component list and what you plan to use the PC for. If your build is geared towards gaming or graphically intensive tasks, adding more fans is almost certainly a good idea. Unless you go very high-end, most cases will only have two fans, even gaming cases. However, there are lots of cases available that provide mounting locations for several more. Just make sure you check sizes (120mm, 140mm, etc.) and look for less than 15dB noise.

THE IMPORTANCE OF AIRFLOW |

The fans that are in your case aren't just about pumping cool air in or dragging warm air out. Each of these processes on their own makes little sense. Pumping cool air into a case that can't expel warm air is pointless. So too is sucking warm air out but not pulling in cool. What matters is airflow through the case, usually front to back and this is not just down to having fans in the right positions. It also has a lot to do with case design, component layout and cable management. You can read more about each of these considerations throughout this guides' pages but for now just remember, a healthy PC needs good airflow.

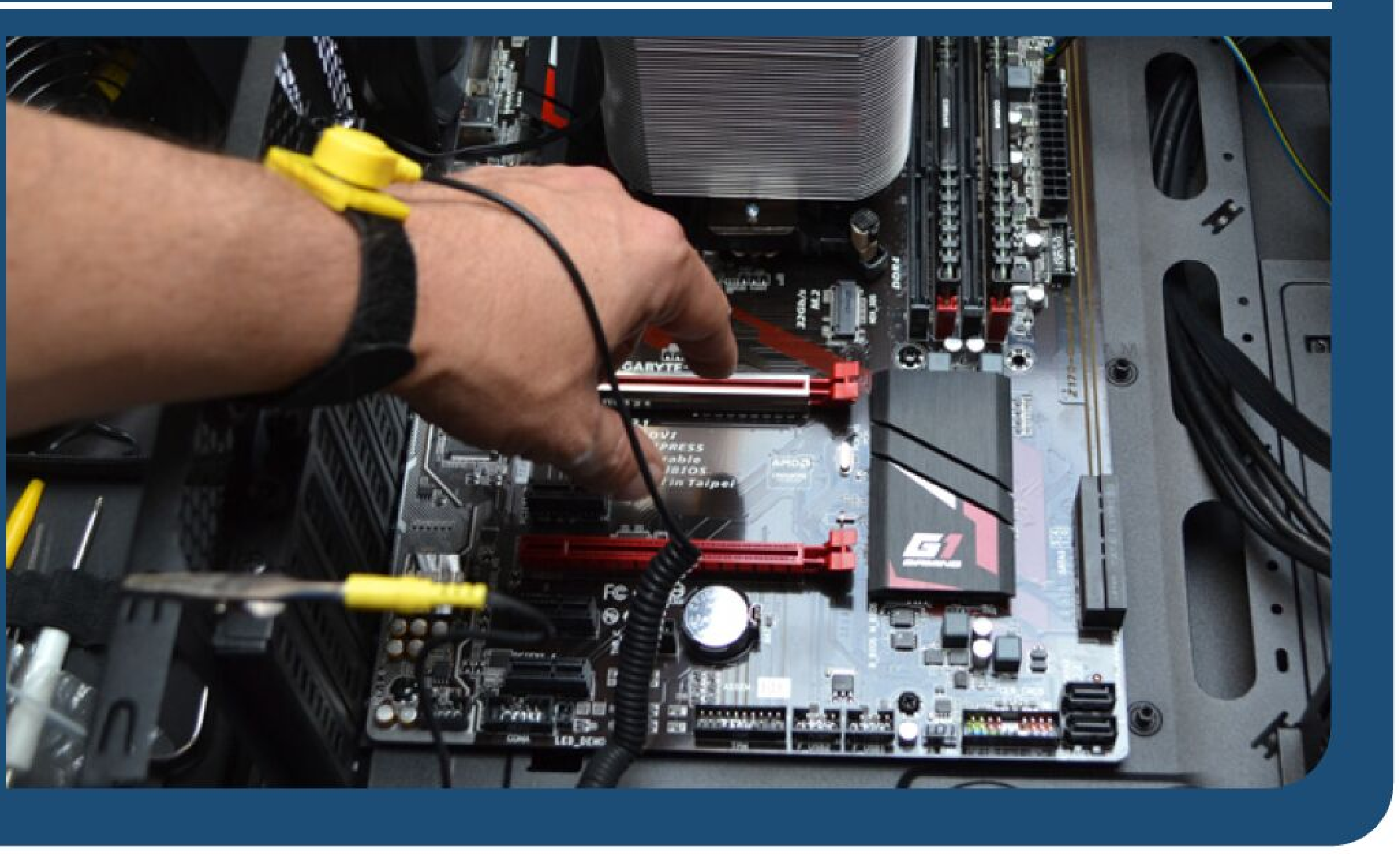
Before You Build - Precautions

Nothing will spoil the joy of building your own PC faster than damaging a critical component before you have even fitted it inside the case. Although there is no need to be scared of a first-time build, there are simple things you can do to prepare for it. Some of the main concerns include electrostatic discharge, dropped parts and damage caused by forcibly fitting together parts or scratched circuits.

ELECTROSTATIC DISCHARGE |

Whenever we move around, particularly on certain surfaces like carpet, our bodies pick up tiny amounts of electricity. This can then be released when we touch conductive surfaces such as metal. Accidental electrostatic discharge can destroy PC hardware but in practice you only need to take the most basic precautions.

You can buy grounded wrist straps fairly cheaply and while they are a little over the top, they can give the novice builder peace of mind. The most basic precaution is to occasionally touch a ground, such as a metal office desk or the metal case of a plugged-in system, to discharge your body. However, even when ESD does occur, it's more likely to follow the component's ground plane rather than blow its most sensitive parts.

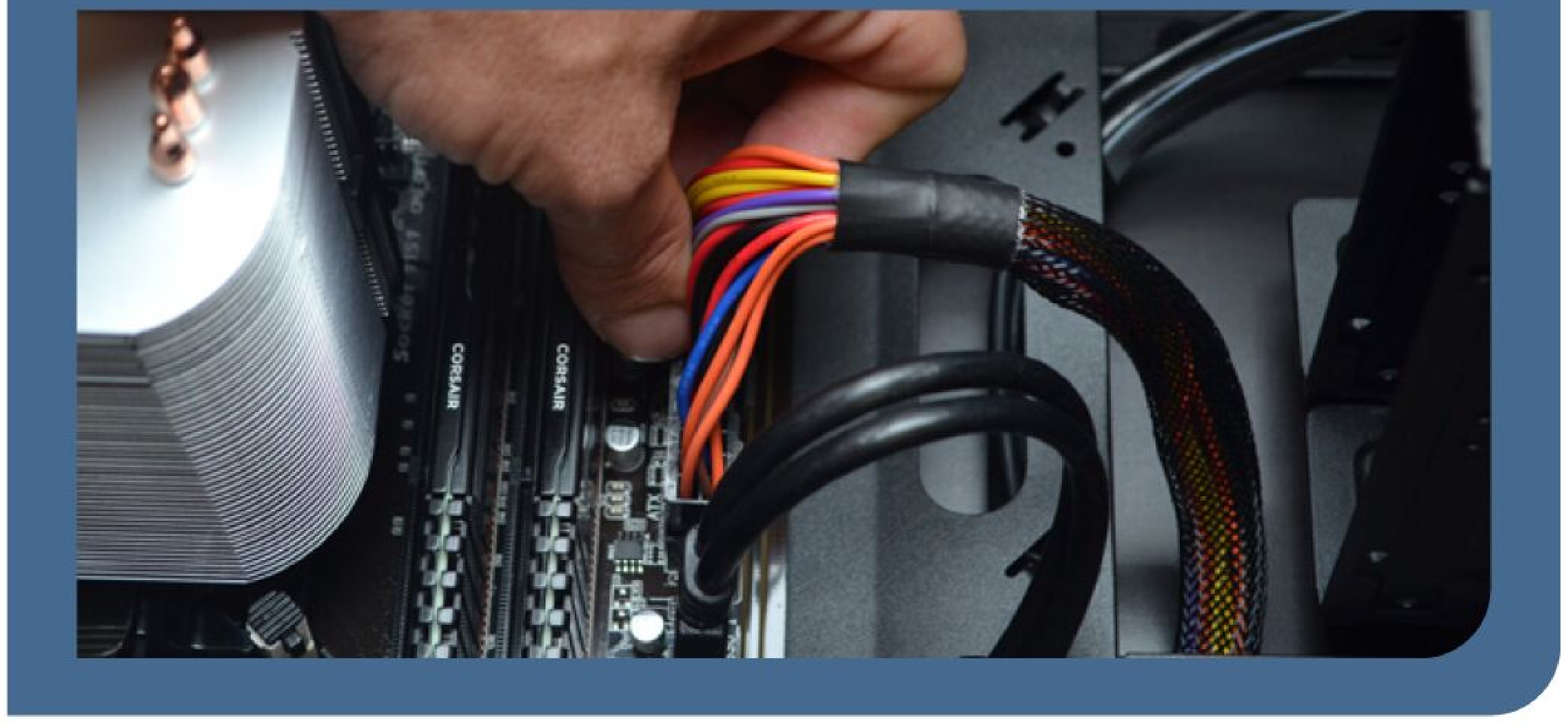


ELECTRIC SHOCK |

When working on your PC or any mains powered equipment, always disconnect it completely from the mains wall socket. Never dismantle the actual PSU in your PC. This unit contains potentially lethal mains voltages, even when it is disconnected from the supply. They are not user repairable. If it fails, replace it with a new one.

CONNECTIONS |

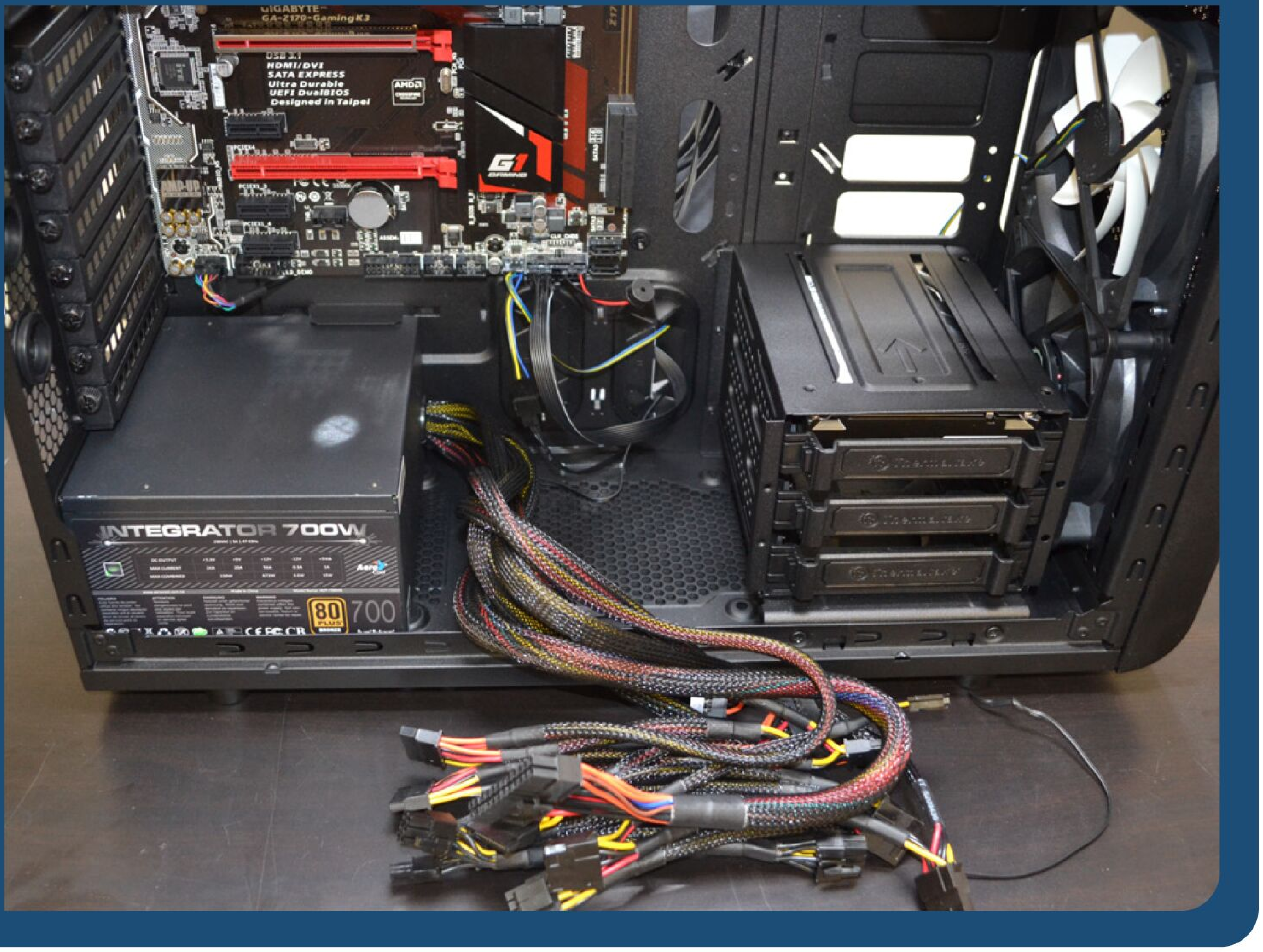
Always remember to completely disconnect the power before connecting or disconnecting components or cables. When making cabling connections of any kind, use firm, even pressure but never excessive force. Small signal pins are very easily damaged if connected incorrectly. If it just won't fit, try to establish a reason rather than giving it a 'hopeful' shove. Most connectors have some kind of alignment system to prevent incorrect connection.



DROPPED COMPONENTS |

It doesn't take much of a fall to break some of the delicate components you will be working with and this is probably a more likely route to killing a graphics card or hard drive than ESD. If possible, reduce the risk of dropped parts by keeping them away from the edge of your build space. Leaving them in their boxes until you are ready to fit them is also a good idea.

Now, one physical issue that even the most cautious of us can't prevent 100% of the time comes from dropping processors into their interfaces at a slight angle. This problem is specific to Intel's latest LGA interfaces because the contact pins have become thinner as the company has added more of them. Intel's pins act like springs, so that even the slightest damage can cause insufficient contact pressure.


GIGABYTE
GA-Z170-Gaming K3
G1
INTEGRATOR 700W
80 PLUS
700

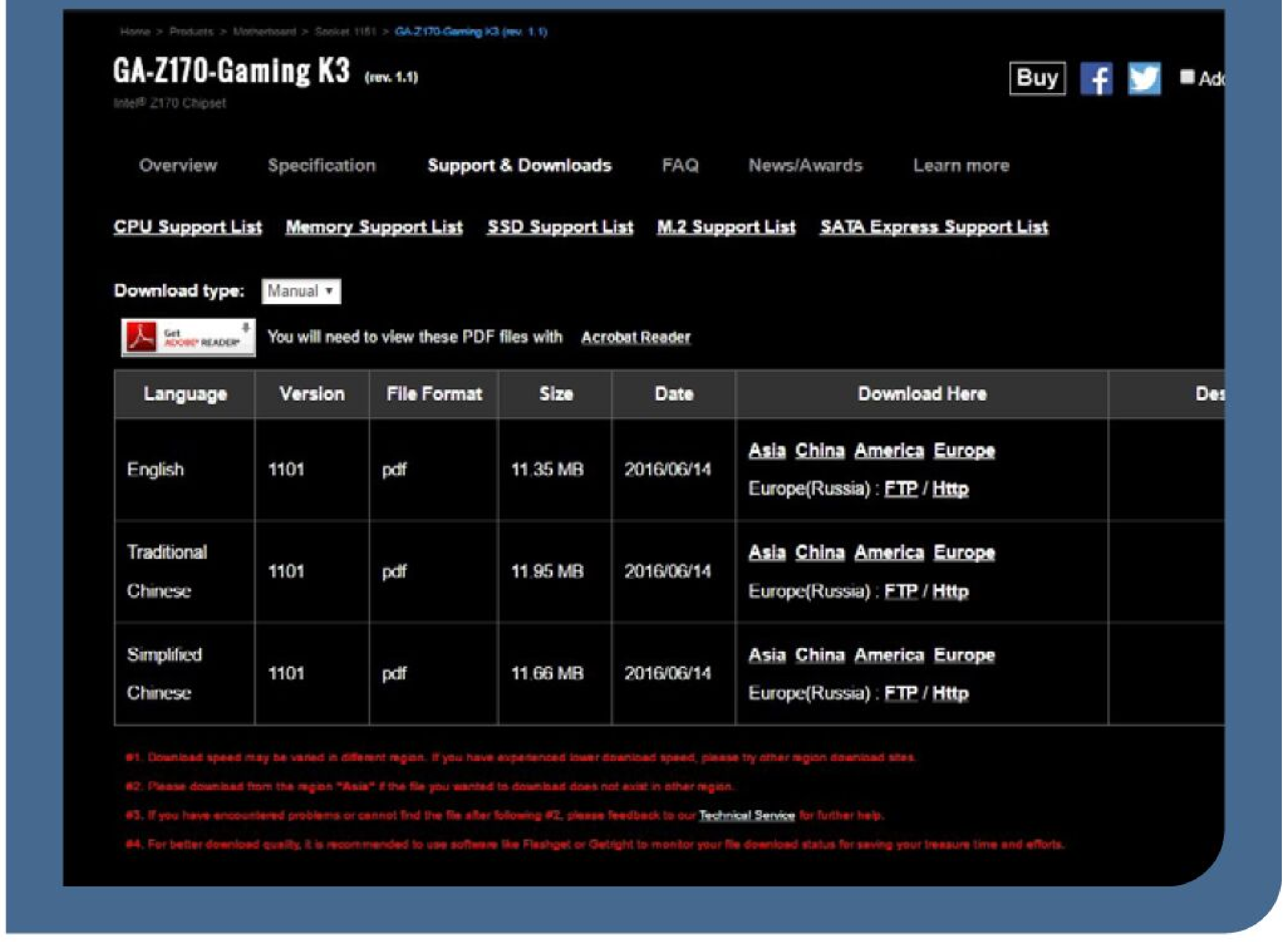
CLEANING COMPONENTS |

hama
THE SMART SOLUTION
Compressed Gas Cleaner
Druckgasreiniger

With the exception of the exterior of the case, never try to clean any part of your system with any liquid detergents or cloths. If you find a build-up of dust inside the machine after some time, disconnect the unit completely, remove the case sides and use an Air Duster to blow out the dust from the case. Air Duster should be available from most electronic supply shops and is basically a can of clean, compressed air.

COMPONENT MANUALS |

Always read the manuals, even if they are really thin, that come with the various components, particularly if you are completely new to building PCs. There is often vital information that can prevent you from plugging something into the wrong place and damaging the whole build. Your motherboard manual is particularly critical. If you don't get a manual in the box, you will be able to find one on the manufacturer website.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Intel® Z170 Chipset

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Build Your Own PC - Jargon Buster

When you start on anything to do with building computers, you will soon see that there are weird phrases and acronyms used all over the place. Whilst this is not a complete list, it does explain most of the more common terms new builders will encounter when putting together their first system.

A...

AGP
Accelerated Graphics Port - a high-speed point-to-point channel for attaching a video or graphics card to a computer's motherboard. Largely superseded by PCI-e now.

ATX
Advanced Technology eXtended - a motherboard form factor specification developed by Intel in 1995 to improve on previous factor standards like AT.

B...

Bandwidth
Bandwidth refers to how much data you can send through a network or modem connection. It is usually measured in bits.

BIOS
Stands for Basic Input/Output System. The BIOS is a program preinstalled on Windows-based computers that the computer uses to start up.

Boot
In simple terms, to boot a computer is to turn it on. Once the computer's power is turned on, the "boot process" takes place. This involves loading the startup instructions.

Boot Disk
A boot disk is a disk that a computer can start up or "boot" from (see above). The most common type of boot disk is an internal hard drive, which is what most computers use.

Bus
A communication system that transfers data between computer components inside a computer or between computers. An example is USB (Universal Serial Bus).

Blu-ray Drive
An optical disc drive capable of reading Blu-ray discs. Available as internal and external versions for use with a PC system.

C...

Cache
A hardware or software component that stores data so future requests for that data can be served faster. Data might be the result of an earlier computation or the duplicate of data stored elsewhere.

Case
Case is variously known as the computer chassis, enclosure, tower, box or system unit. The variety of different case styles is huge. Case form factor is determined by motherboard size.

CD-ROM
Compact Disc Read-Only Memory - a pre-pressed optical compact disc that contains data or music playback.

Chip
A miniaturised electronic circuit that has been manufactured in the surface of a thin substrate of semiconductor material.

Chipset
A group of integrated circuits or chips, that are designed to work together. They are usually sold as a single product.

Clock Cycle
A clock cycle or clock tick, is one increment of the CPU clock, during which the smallest unit of processor activity can be performed. Common clock cycle activities include load, store and jump operations.

Clock Speed
The clock speed of a processor is measured in clock cycles per second or hertz. For example, a CPU that completes three billion clock cycles per second has a clock speed of 3,000 megahertz, or 3GHz.

CMOS
Stands for Complementary Metal Oxide Semiconductor. The low power consumption of CMOS allows the memory to be powered by a simple Lithium battery for many years.

Core
A portion of a CPU which actually performs arithmetic and logical operations. A CPU may have multiple cores. An example would be a quad-core processor.

CPU
A Central Processing Unit is the electronic 'brain' of a computer that carries out the instructions of a computer program by performing the basic arithmetic, logical, control and I/O operations.

D...

DDR
Stands for Double Data Rate and is an advanced version of SDRAM, a type of computer memory. It can transfer data twice as fast as regular SDRAM chips. DDR2, DDR3, DDR4 are all newer, faster versions.

Disk Drive
A device that reads and/or writes data to a disk. It can refer

to your internal hard disk drive, as well as optical drives that read removable CDs and DVDs.

DIMM
Dual In-line Memory Module. A DIMM is a small circuit board that holds memory chips. DIMMs have faster data transfer capabilities than SIMMs and have pretty much replaced SIMMs.

DVI
Stands for Digital Video Interface. Most DVI ports support analogue and digital displays. If the display is analogue, the DVI connection converts the digital signal to an analogue one.

DRAM
Dynamic Random Access Memory is the most common type and is synchronous; SDRAM is a faster version of standard DRAM.

E...

EIDE
EIDE is short for Enhanced Integrated Drive Electronics and is an improved version of the IDE drive controller standard.

Expansion Card
Any printed circuit board installed into a PC to add functionality. For example, a user may add a USB card with extra ports to allow the addition of more external devices.

F...

FAT32
Refers to the way Windows stores data on your hard drive. FAT stands for File Allocation Table; it is an improvement to the original FAT system.

Firmware
Firmware is a software program or set of instructions programmed on a hardware device. It provides the necessary instructions for how the device communicates with the other computer hardware.

Flash Memory
Flash memory is a type of electrically erasable programmable read-only memory (EEPROM). A common use of flash memory is when storing the BIOS settings in a computer's ROM.

FSB
Frontside Bus. The FSB connects the computer's processor to the system memory (RAM) and other components on the motherboard.

G...

GDDR
Graphics Double Data Rate. This is the type of memory that is used in graphics cards. The current specification is GDDR5 which has a maximum transfer rate of 20GB/s.

Gigabyte
A gigabyte is 1,024 megabytes and precedes the terabyte unit of measurement. Hard drive sizes are typically measured in gigabytes or terabytes.

Gigahertz
One gigahertz is equal to 1,000 megahertz (MHz). It is commonly used to measure computer processing speeds.

GPU
Graphics Processing Unit. The GPU is used primarily for computing 3D functions. This includes things such as lighting effects, object transformations and 3D motion.

GUI
Graphical User Interface. It refers to the graphical interface of a computer that allows users to click and drag objects with a mouse instead of entering text at a command line.

H...

Hard Disk
Also known as the Hard Drive. The hard disk is housed inside the hard drive, which reads and writes data to the disk. The hard drive also transmits data back and forth between the CPU and the disk.

HDD
HDD is short for "hard disk drive." An HDD is a storage device used to store data.

HDMI
High-Definition Multimedia Interface. HDMI is a digital interface for transmitting audio and video data in a single cable. It is supported by most HD TVs and related components.

Heatsink
The heatsink is made out of metal, such as a zinc or copper alloy and is attached to the processor with a thermal material that draws the heat away from the processor towards the heatsink.

Hyper-threading
Hyper-threading is a technology developed by Intel. It enables the a processor to execute two threads, or sets of instructions, at the same time.

I...

I/O
Input/Output. The ports on the outside of a computer are commonly referred to as I/O ports because they are what connect input and output devices to the computer.

IGP
Integrated Graphics Processor. An IGP is a graphics chip that is integrated into part of a computer's motherboard.

Input Device
An input device is any device that provides input to a computer. This includes things like a mouse or keyboard.

J...

Jumper
A small metal connector that acts as an on/off switch. A jumper is usually placed over 2 wires, which makes a connection and turns the connection "on". Jumpers are mainly found on motherboards, but can occasionally still be found on IDE hard drives and DVD drives.

K...

Kbps
Kilobits Per Second. Often confused with Kilobytes per second, which is 8 times more data per second.

Kilobyte
A kilobyte is 1,024 bytes. Most small files on your computer are measured in kilobytes.

L...

LAN
Local Area Network. A LAN is a computer network limited to a small area such as an office building, university or even a residential home.

Latency
Amount of time it takes a packet of data to move across a network connection. Latency and bandwidth are the two factors that determine your network connection speed.

Linux
Linux is a free, open source operating system. Widely used by Web hosting companies and has many other specialised applications.

M...

MBR
Master Boot Record. This is the first sector on a hard drive. The MBR holds the partition tables and bootstrapping information that allows the operating system to take over operations during initial boot up.

Mbps
Megabits Per Second. One megabit is equal to one million bits or 1,000 kilobits. Used to measure data transfer speeds of high bandwidth connections.

Megahertz
The most common area you will see Megahertz used is in measuring processor clock speed.

Memory
Generally used to refer to any electronic data storage facility in a computer system.

Memory Module
A memory module is another name for a RAM chip. It is often used as a general term used to describe SIMM, DIMM and SO-DIMM memory.

Microprocessor
More often referred to as a processor, it is the brains of a computer. Common microprocessors include the Intel Core i5 and i7 range, and the AMD FX processors.

Multithreading
Multithreading is similar to multitasking but enables the processing of multiple threads at one time, rather than multiple processes.

N...

NIC
Network Interface Card. Pronounced "nic", this is the card that connects your computer to a network cable and through that to the Internet. These cards come in speeds of 10, 100, and 1000 T-Base configurations. Meaning they can transfer data at 10, 100, and 1000Mbps.

NTFS
New Technology File System. NTFS is a file system introduced by Microsoft with Windows NT and is supported by subsequent versions of Windows.

Northbridge
The Northbridge is a chip inside a computer that connects the central processing unit (CPU) to other primary components in the system.

O...

OEM
Original Equipment Manufacturer. This refers to a company that produces hardware to be marketed under another company's brand name.

Operating System
Also known as OS. The software that communicates with computer hardware on the most basic level. Without an operating system, no software programs can run.

Optical Drive
Some common types of optical drives include CD-ROM, CD-RW, DVD-ROM, DVD-RW and Blu-ray.

Overclocking
Overclocking involves increasing the clock speed of the computer's CPU past the rate at which it was originally designed to run.

P...

Parallel Port
This 25-pin connector interface is found on the back of older PCs and is used for connecting external devices such as printers or scanners.

Partition
A partition is a section of a hard disk. You can create multiple partitions on a hard disk. The computer will recognize each partition as a separate disk.

PCI
Peripheral Component Interconnect. Most add-on cards such as SCSI, Firewire and USB controllers use a PCI connection.

PCI Express
An improved version of PCI. PCI Express can be abbreviated as PCIe.

Peripheral
A peripheral is any device that provides an external function for the computer. Examples are printer, monitor and speakers.

Platform
Platform can refer to a computers operating system or, when building a PC, can refer to the combination of motherboard, CPU and memory.

Port
There are several different uses for the word "port" but when looking at hardware (and building), it generally means the sockets where peripherals are connected to the PC.

POST
Power On Self Test. A test performed by the computer at boot up that tests the memory, CPU and various I/O devices. On a correctly working PC, you should not even know this test is taking place.

Processor
Sometimes referred to as the microprocessor or CPU, the processor does all the computations such as adding, subtracting, multiplying and dividing.

Q...

Quad-core
Quad-core CPUs have four processing cores. These cores act as separate processors but are contained in a single chip.

R...

RAID
Redundant Array of Independent Disks. When hard disks are arranged in a RAID configuration, the computer sees them all as one large disk.

RAM
Random Access Memory. RAM is made up of small memory chips that form a memory module.

ROM
Read Only Memory. ROM is memory that is written to once and cannot be changed. It is used in computers mainly for the BIOS instructions when booting up.

S...

SATA
Serial Advanced Technology Attachment or Serial ATA. An interface used to connect ATA drives to a computer's motherboard.

SDRAM
Synchronous Dynamic Random Access Memory. SDRAM is an improvement to standard DRAM because it retrieves data alternately between two sets of memory.

SLI
Scalable Link Interface. SLI is a technology developed by NVIDIA that allows multiple graphics cards to work together in a single computer system.

Socket
Socket refers to several things in computing but when building it normally refers to the places on the motherboard where components such as the CPU are plugged in.

Southbridge
The Southbridge is a chip that connects the Northbridge to other components inside the computer, including hard drives and network connections.

SSD
Solid State Drive. An SSD serves the same purpose as a hard drive but uses flash memory rather than a spindle of magnetic disks.

T...

Terabyte
A terabyte is 1,024 gigabytes. Many modern hard drives are now measured in multiple terabytes, which is a huge amount of storage.

TCP-IP
Transmission Control Protocol - Internet Protocol. These 2 protocols allow computers to communicate over networks. The TCP portion verifies the delivery of the packets (clumps of information), and the IP portion determines where the packet needs to be sent.

U...

USB
Universal Serial Bus. A very common type of PC port. It can be used to connect keyboards, mice, game controllers, printers, scanners, digital cameras and removable media drives.

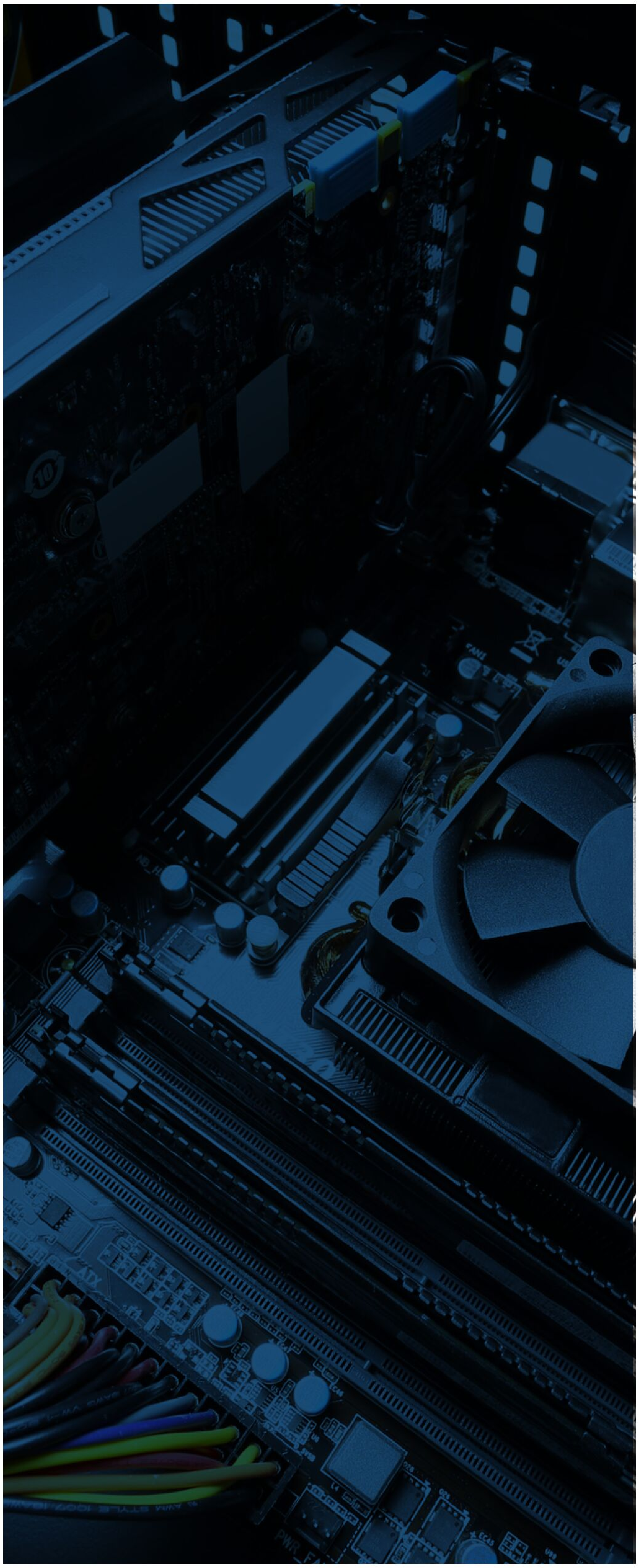
V...

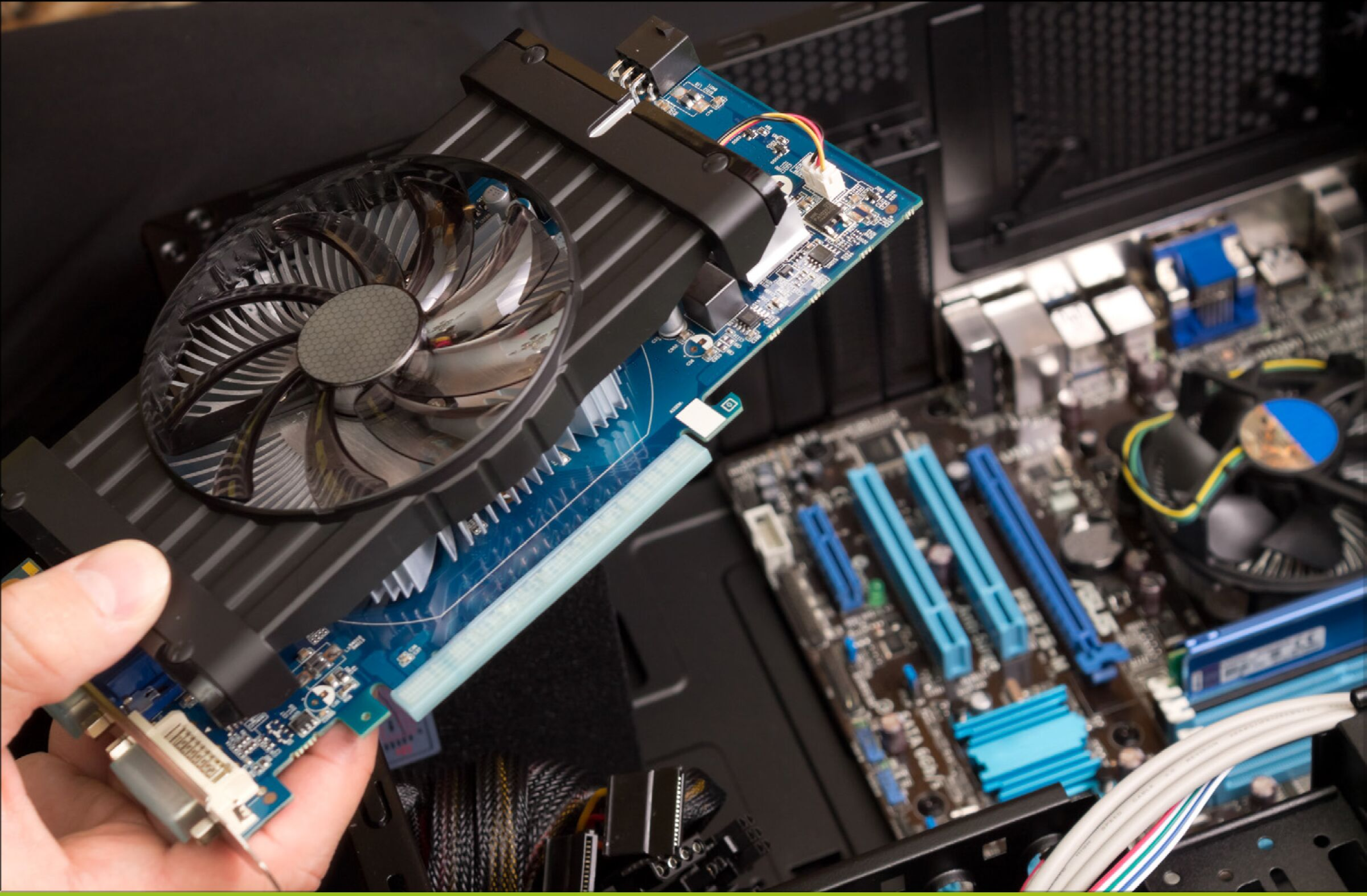
VGA
Video Graphics Array. The VGA standard was originally developed by IBM in 1987 and allowed for a display resolution of 640x480.

Virtual Memory
Virtual memory is memory that is located on your hard drive. Virtual memory is used if your computer runs out of space in its RAM. Virtual memory is much slower than RAM.

X...

X86
X86 is the generic name for Intel processors released after the original 8086 processor. These include the 286, 386, 486, and 586 processors.





Building Your PC

> **Now it's time to get your hands dirty! This section runs through a complete PC build, from start to finish, highlighting each step and looking at possible problems you might encounter along the way. As long as you have planned well, this stage should not take very long. It is, however, better to take your time and do it right, rather than rushing through.**

GETTING READY TO BUILD/OUR BUILD

Before you dive in and start to put your PC together, it's important to step back and make sure you have everything you need, and that you have taken the right precautions to avoid accidents to yourself and the components you will be handling. These simple tips will help make your build much safer.

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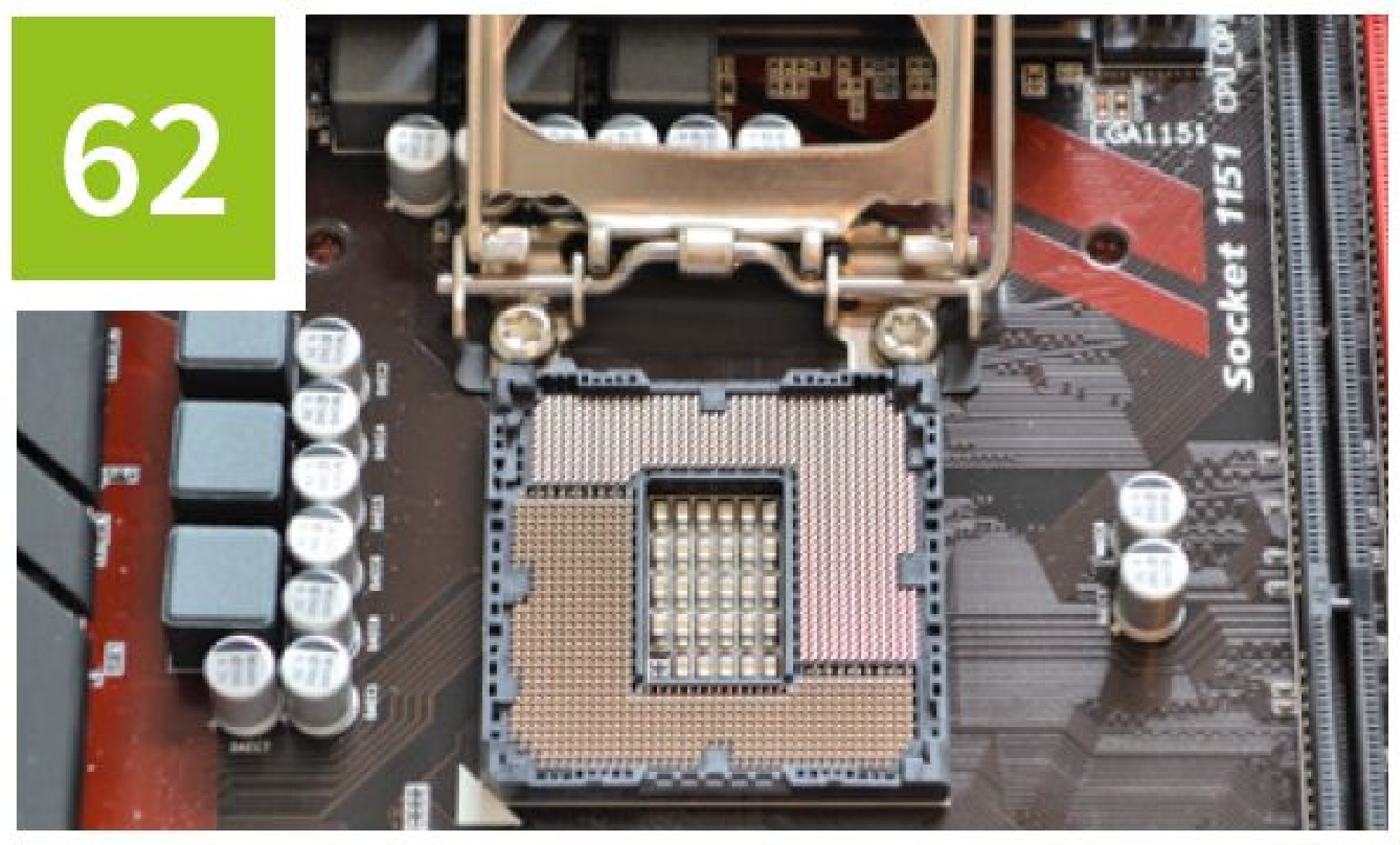
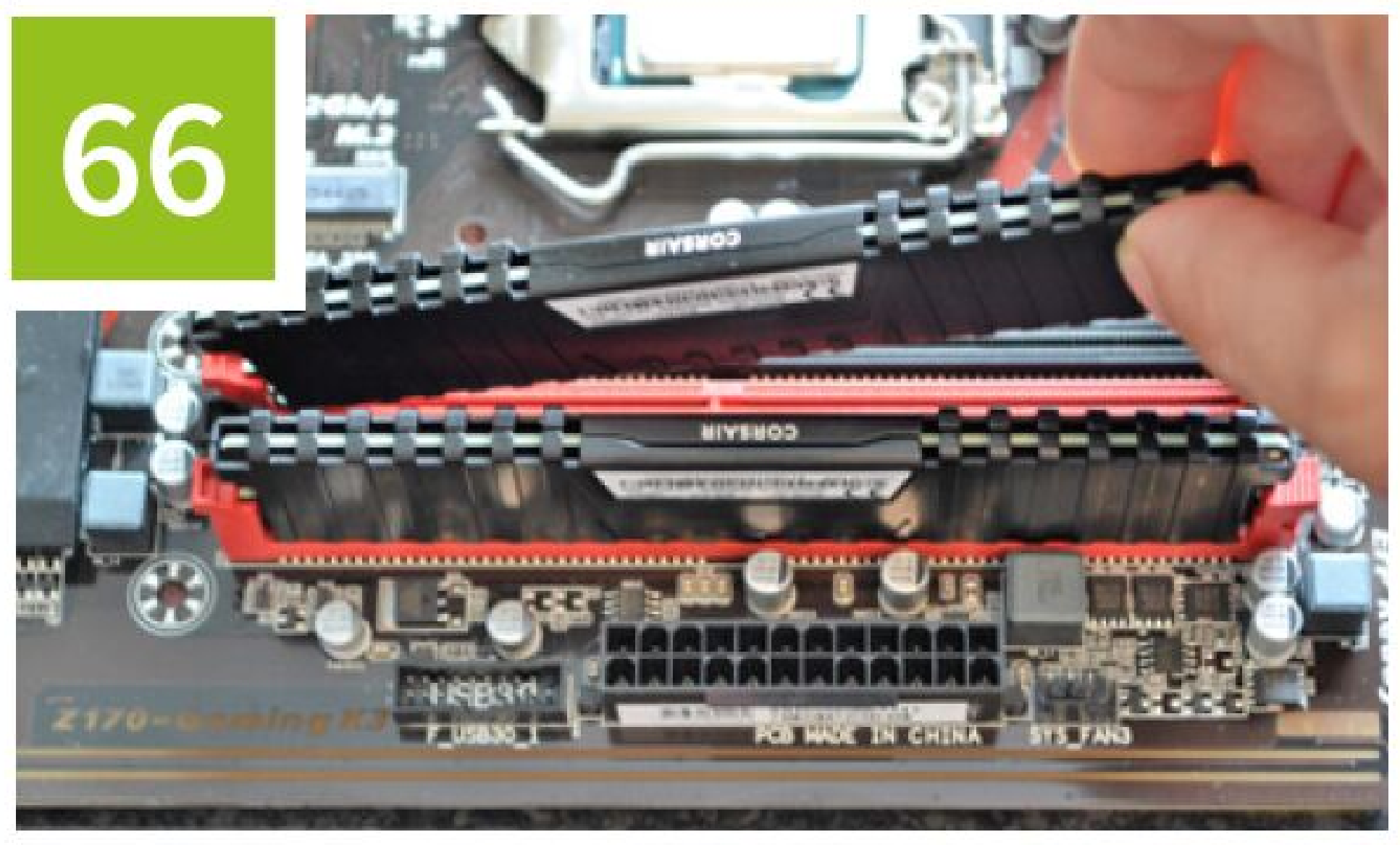
PREPARING THE CASE

Thankfully the days of grey boxes are well and truly over and our choice of PC case is interesting and varied.



FITTING THE CPU

The processor is usually the most expensive single component, so installing it safely and corraectly is important.

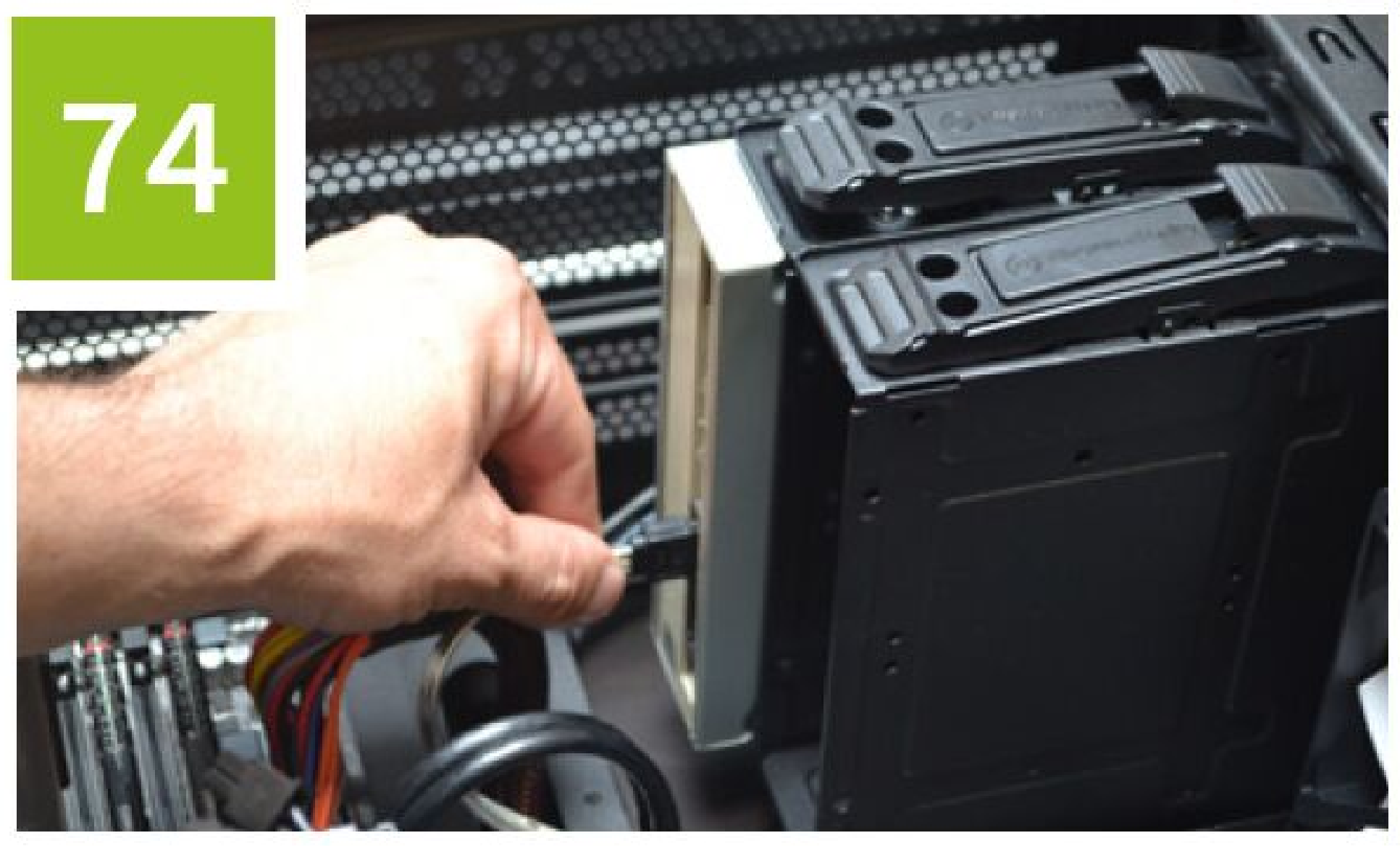


FITTING THE DIMM'S

How you fit the memory into the motherboard sockets depends on how many matched modules you install.

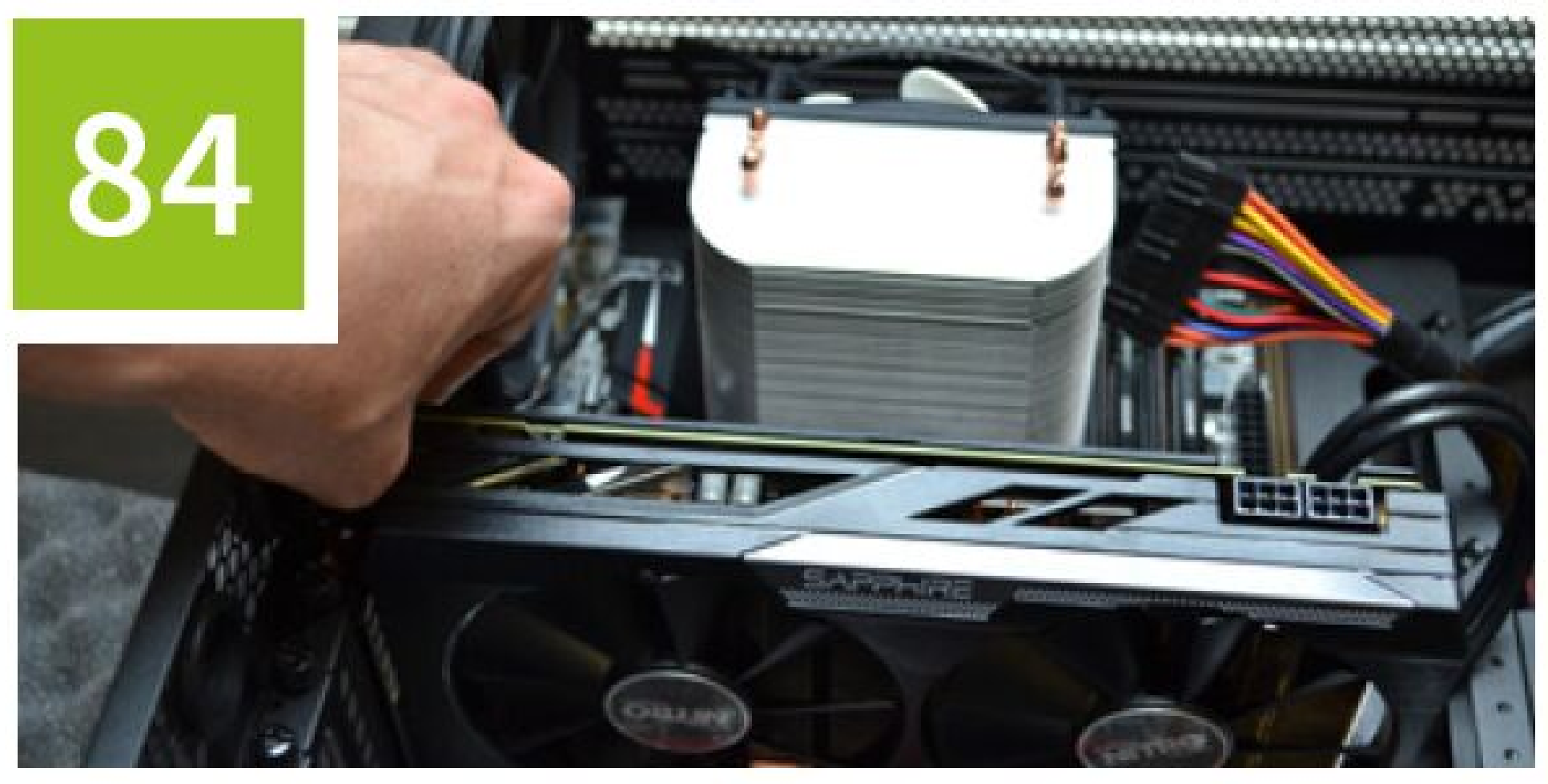
FITTING THE HDD

Toolless or screw-less hard drive mounting cradles are increasingly the norm for modern computer cases.



FITTING OPTICAL DRIVES

DVD drives are still a useful addition and as they are cheap there is no reason not to add one to your first build.



FINAL BUILD CHECKS AND FIRST BOOT

Before you boot, go back and check that all cables are connected and everything is looking ready to go.

Getting Ready to Build

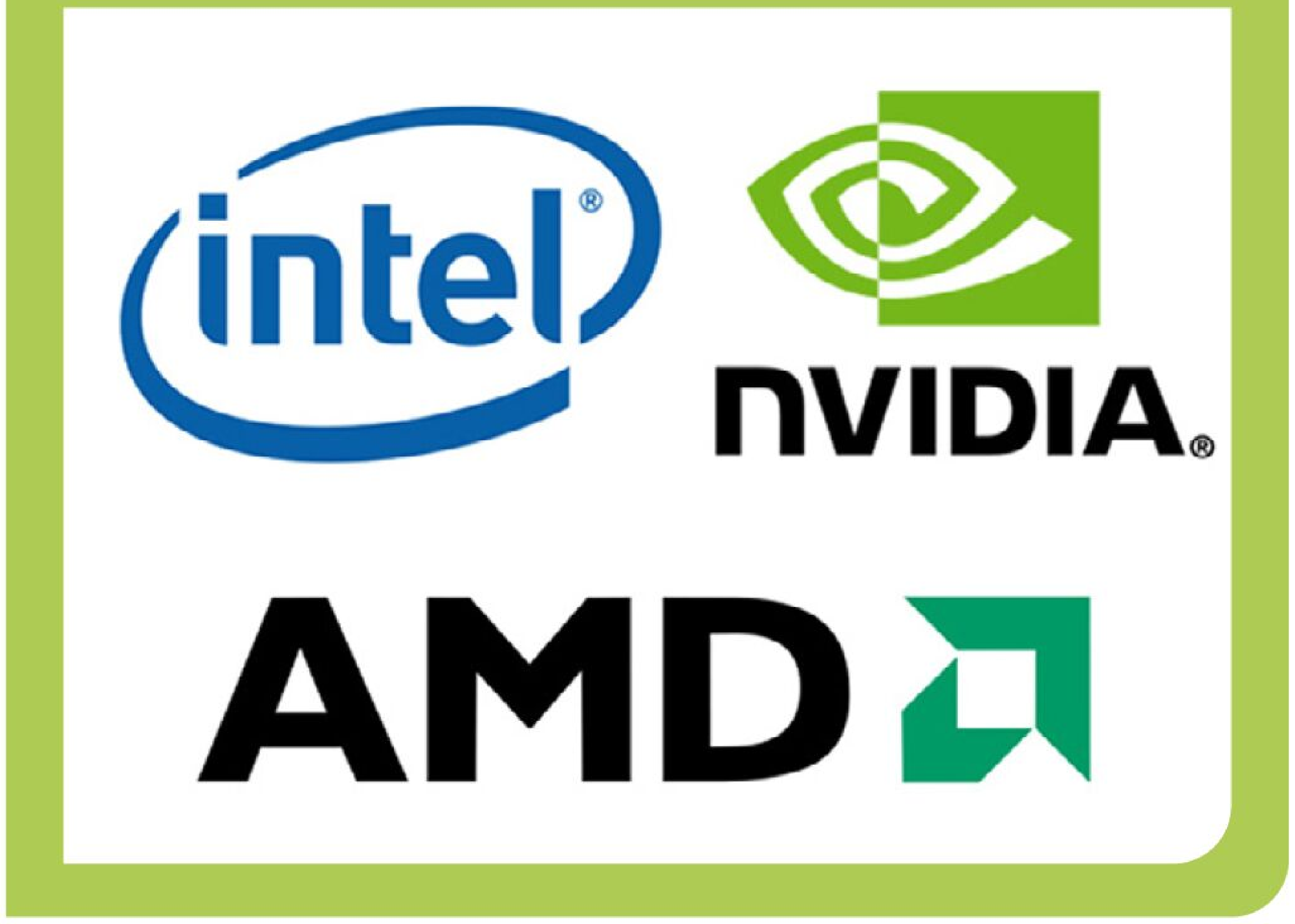
A successful first PC build should be as organised as possible, so making sure you follow each step in the right order is important. It is no good planning your build without know what you want to use the PC for, just as it is no good starting to put things together without knowing all of the components you want or need. At this point, you should be done with your hardware selection, so let's just take a moment to ensure you are ready to build.

CHECK YOUR COMPONENTS |

Lay everything out in one place and make sure you have everything you need for your build. Once you start building, it really shouldn't take more than a day, even for a first build, if you follow each of the upcoming guides fully and in order. It can be annoying though if, halfway through, you have to stop and order a missed cable or fan.

CHECK COMPATIBILITY |

Take some time to make sure that everything you have bought and acquired for your build is compatible. Read through the motherboard manual, do some online research for the components you have in front of you and check that everything works together. Now is the best time to return or exchange an incorrect component, not after you have tried forcing it into an incorrect socket several times. Simple first boot problems can be avoided with just this step.



GET THE RIGHT TOOLS |

Many PC builds now require nothing more than a single crosshead screwdriver and opposable thumbs, thanks to toolless case designs, thumb screws and drive caddies. However, for your first build we would advise having a few extra tools at the ready. The screwdriver is a must and it is also useful to have a small pair of long-nosed pliers, a small torch (or an angle-poise lamp, even a head torch) and an anti-static wrist strap.

Many experienced PC builders will tell you that this last one is not so important when you know what you are doing, being sure to ground yourself carefully before touching components, but it is very easy to damage parts without even realising it, so go ahead and spend the small amount of money one of these safety devices costs. You can buy basic PC toolkits cheaply online that contain a variety of useful extras such as tweezers, spare screws, cable ties, etc.

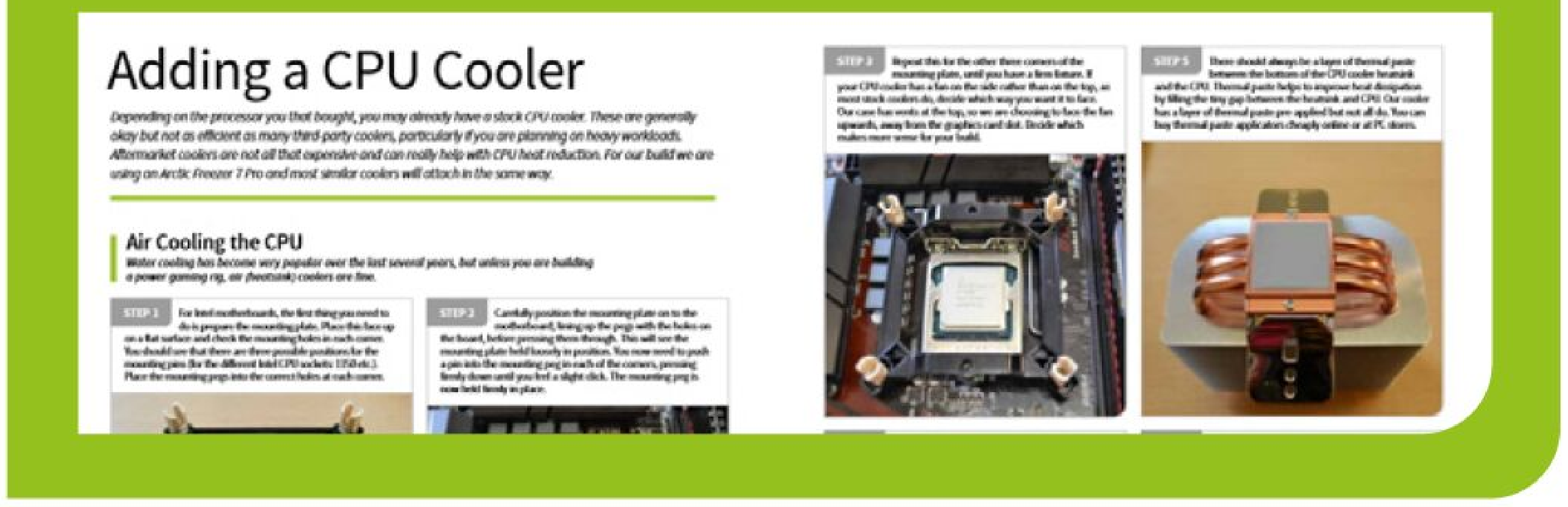
CHECK YOUR SOFTWARE

Make sure that you understand what you are doing about the OS. Do you need to buy a new disc? Is it going to be easier to install from a USB flash drive? Do you need to get downloads or information from an older PC, especially if you are planning to cannibalise it for the new build? Nothing is more frustrating than having a perfectly built PC sitting unusable on your desk because you forgot to buy or find an operating system to install.

Microsoft
Windows 10
Pro

READ AHEAD OF EVERY STEP

This might sound a bit confusing but we just mean that it's worth reading one step ahead of the one you plan you do next. This may highlight any problems or complications you need to take into account. Even if you don't ready the whole of the next step, at least skim it. You can often avoid problems just by doing this slight forward planning.



Adding a CPU Cooler

Depending on the processor you that bought, you may already have a stock CPU cooler. These are generally okay but not as efficient as many third-party coolers, particularly if you are planning on heavy workloads. Aftermarket coolers are not all that expensive and can really help with CPU heat reduction. For our build we are using an Arctic Freezer 7 Pro and most similar coolers will attach in the same way.

Air Cooling the CPU

Water cooling has become very popular over the last several years, but unless you are building a power gaming rig, air (heatsink) coolers are fine.

OUR BUILD

We have listed the components we are using in our build throughout the planning section, often with reasons why we have chosen each one. Here you can take a look at our complete component list.

CPU – Intel Core i5 6600K (Skylake)

Motherboard – Gigabyte Z170-Gaming K3

Hard Drive – Seagate 2TB Hybrid Drive (8GB SSD)

Graphics Card – SAPPHIRE Radeon NITRO R9 380 4GB

RAM – Corsair Vengeance 16GB (2x8GB) DDR4 2133MHz

PSU – Aerocool Integrator 700W (80+ Certified)

Case – Thermaltake Core V31 Midi Gaming Case

CPU Fan – Arctic Cooling Freezer 7 Pro CPU Cooler

Case Fan – Arctic Cooling Arctic F12 120mm

Although peripherals such as a monitor, keyboard and mouse could be classed as part of a PC build, and definitely will be if this is your first PC, we are using ones that we already have available. If we were choosing fresh peripherals for this build, we would go for:

Monitor - Acer G226HQ 21.5" LED LCD

Keyboard - Cherry G85-23200 Stream 3.0 Keyboard

Mouse - Element Gaming Mouse Cobalt 220

intel
INTEL CORE i5 DESKTOP PROCESSOR UNLOCKED
Desktop Processor
CORE i5
UNLOCKED
GIGABYTE
Z170-GAMING K3
G1 GAMING
GIGABYTE
GA-Z170-Gaming K3

Preparing the Case

Choosing a case used to be almost an afterthought when building a custom PC. One grey box was much the same as another grey box. Thankfully the days of grey boxes are well and truly over and our choice of PC case ranges from tiny media boxes designed to go next to a TV, to bespoke glass towers aimed at those who want to show off their perfectly co-ordinated components. However, whichever case you choose, some preparation is needed before beginning your build.

Access and Configure the Case

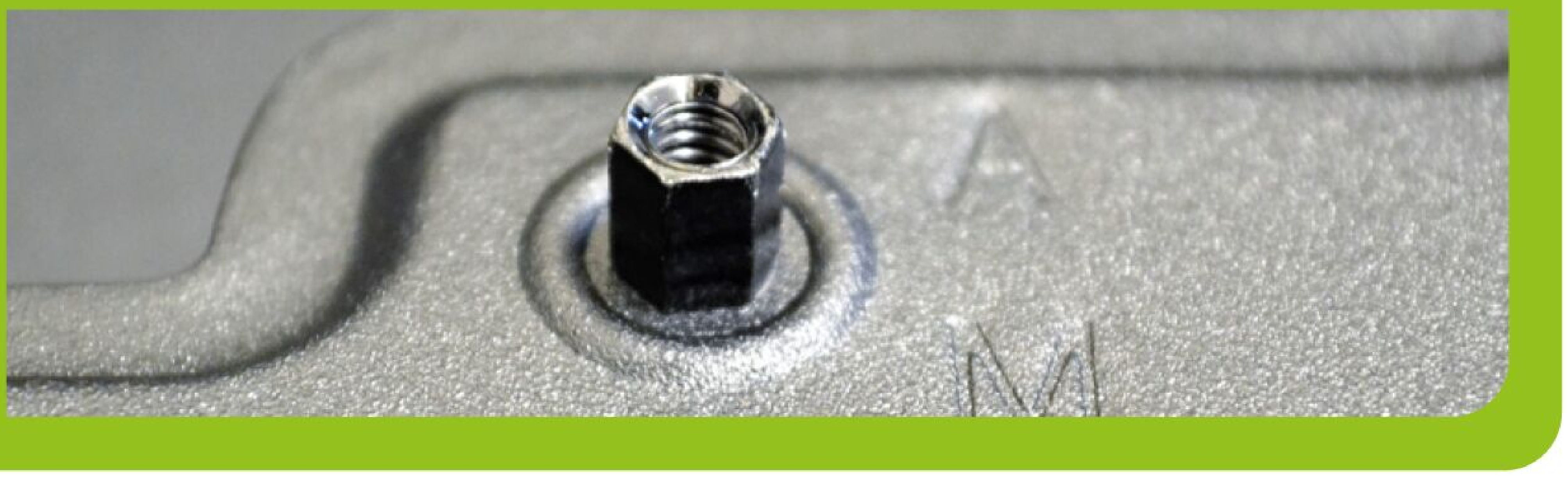
We are assuming that you are working with a fairly standard tower case. If you are building in a case with an unusual form factor, preparation steps may be different.

STEP 1 The first thing to do is take both side panels off of the case; some cases might only have one but rarely. Many modern cases use thumbscrews to hold the panels in place but some may just use standard crosshead fixing screws. In either case, they will be along the edge at the back. Even with cases that use thumbscrews, you might need to use a screwdriver when initially loosening them.

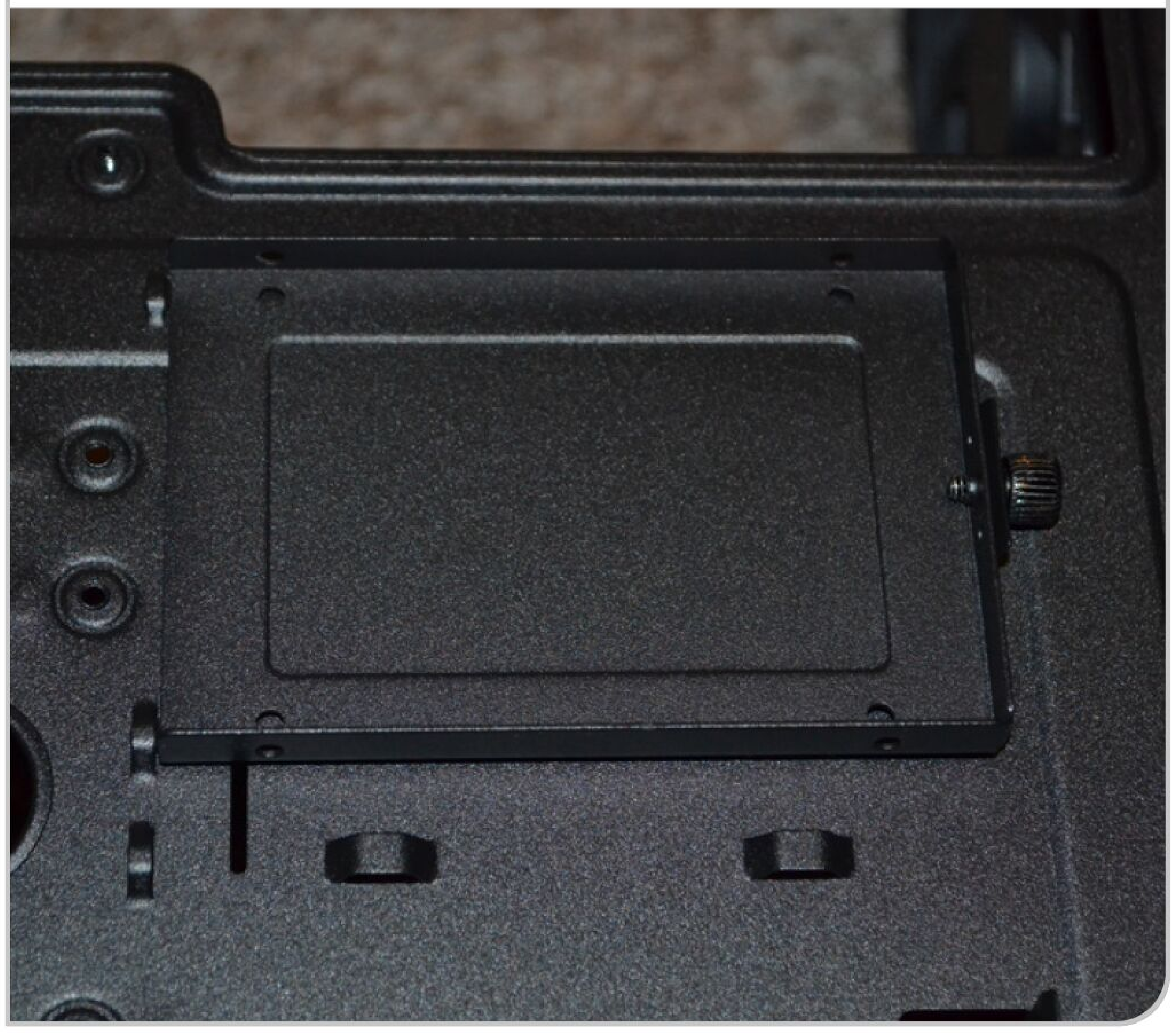
STEP 2 As you look at the front of the case, the left-hand panel is usually the main access panel, with the right-hand panel giving access to some fixing screws and the cable management space inside. Cable management is an important part of any build and will be discussed in detail later. Generally the only cases that don't follow this format are Micro ITX and frame mounted cases.

MOTHERBOARD RISERS OR SPACERS

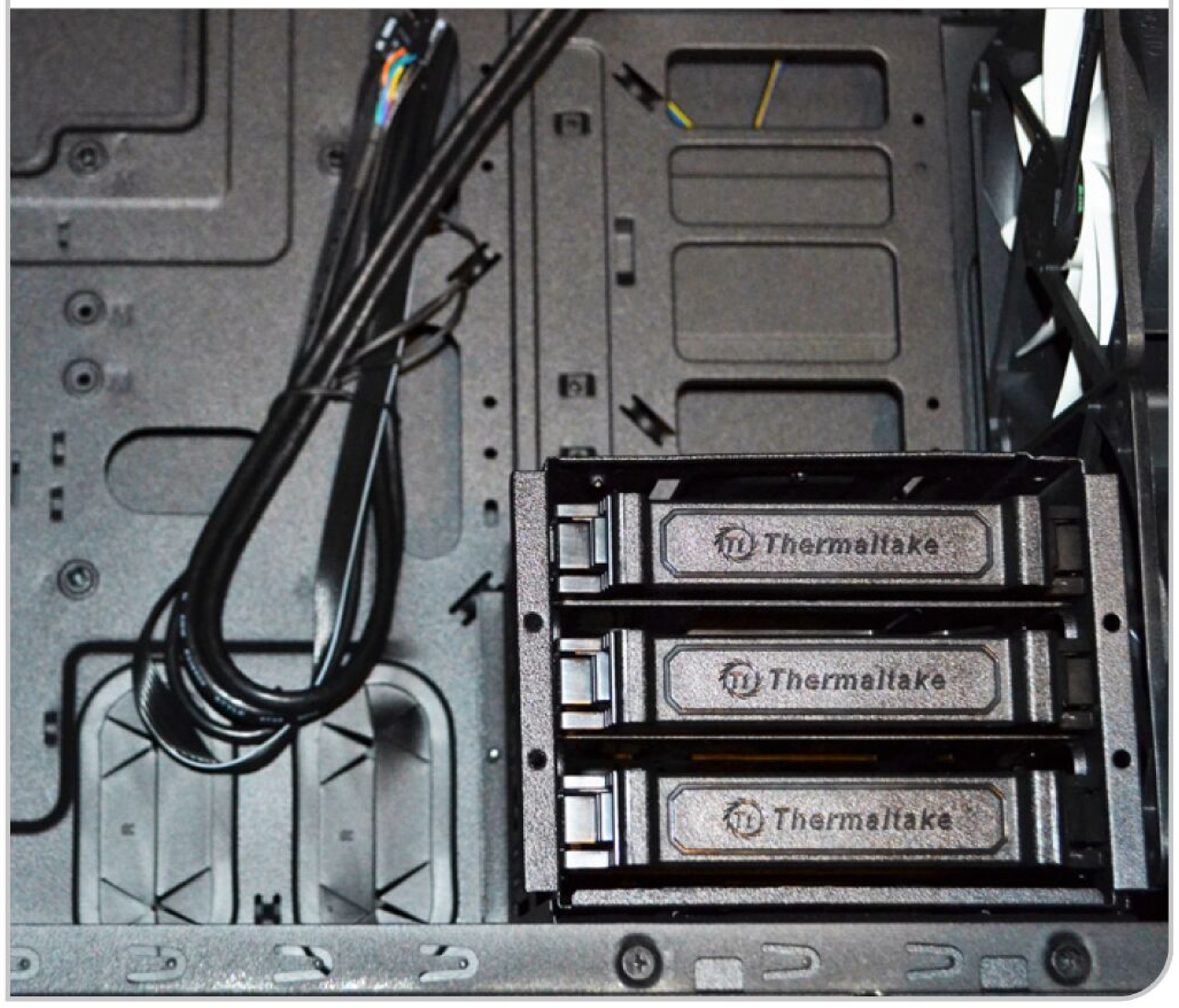
The final part of preparing the case is to fit or move the motherboard risers or spacers (also known as Standoffs) to the correct locations. These double-threaded pegs hold the motherboard off the surface of the case to avoid shorting the board out and are essential. Many cases are marked to show their positions for different motherboard sizes (ATX, mATX etc.).



STEP 3 As you can see, the Thermaltake Core V31 case we are using for our build also has some extra features behind the slightly expanded right-hand panel. As well as the expanded panel giving more cable space, there are also two moveable SSD cradles hidden back there. During the build process it is usually a good idea to leave the right-hand panel off the case.

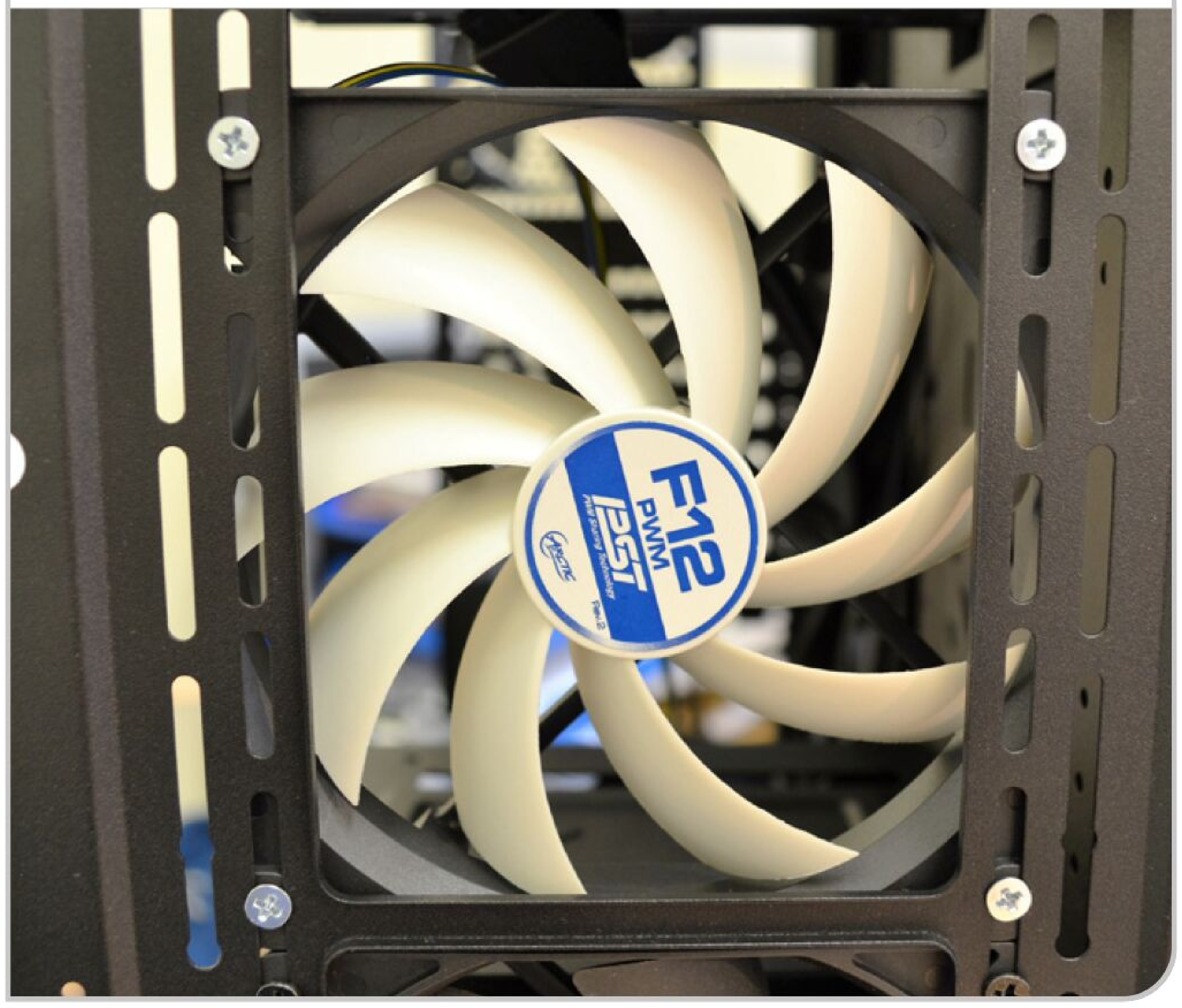


STEP 4 However, if you prefer you can replace the panel before you start adding components. Depending on the case you are using for your build, you might also be able to move or remove the optical drive racks and the hard drive racks, which are usually at the front of the case. Removing unwanted racks can help to increase airflow or just give more room for large components.



STEP 5 Most cases come with at least two fans preinstalled, one behind the front panel to suck air in and one at the back to expel warm air. Almost every modern case will be capable of having more fans. If you purchased additional case fans, now is a good time to fit them. To fit an additional front fan, you will normally need to remove the front panel.

STEP 6 This is normally held in place with simple plastic split pegs and a firm pull will remove it. Be aware that your case will have wiring running from the power switch etc. on the front panel, so don't pull too hard. If an additional front fan can be fitted, you will see standardised fixing points and normally for either 120mm and 140mm case fans. Use the supplied screws to fit it.

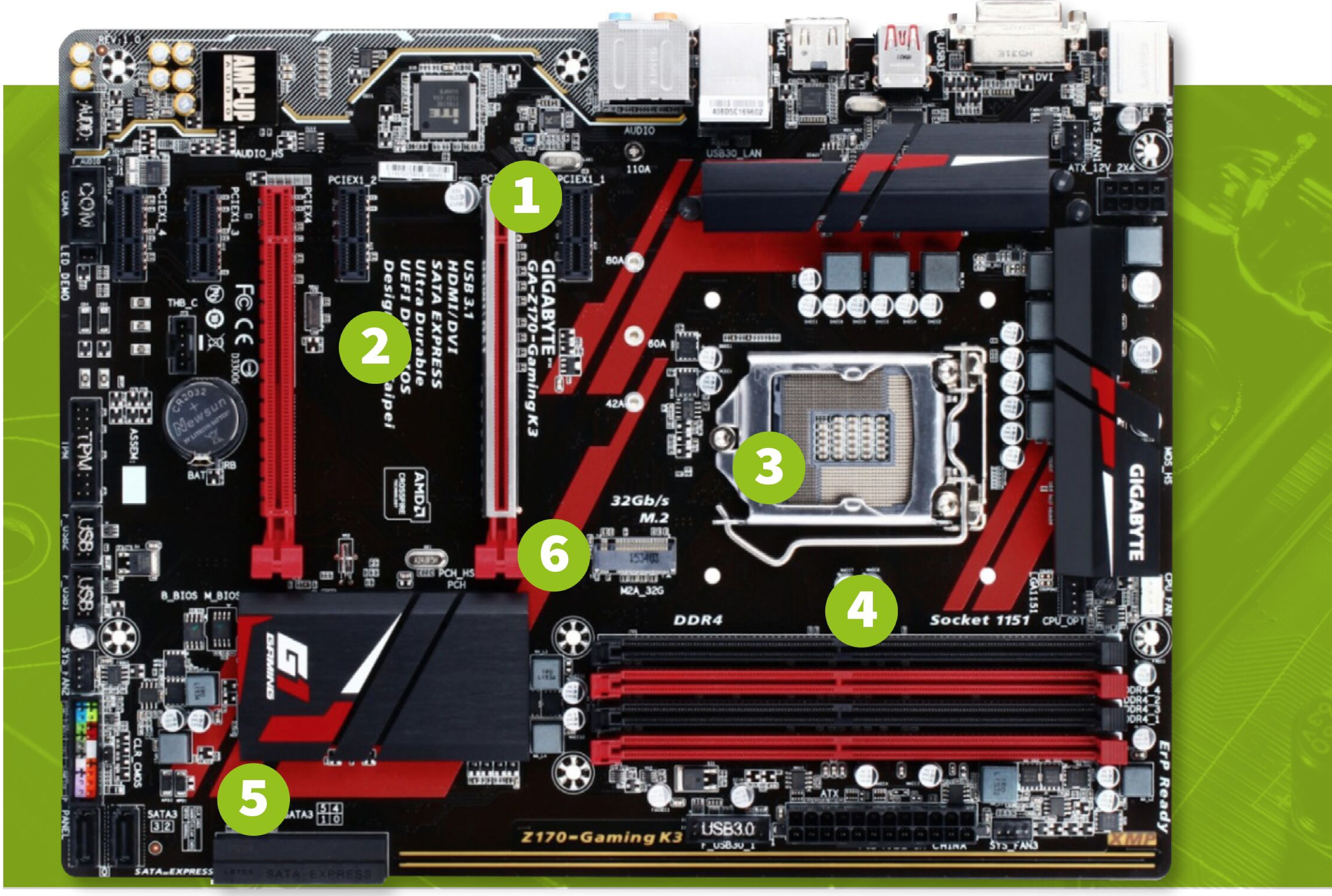


Navigating Your Motherboard

We will be referring to specific parts of the motherboard in detail as we work our way through the build but for now it is a good idea to familiarise yourself with how a standard motherboard is laid out, where the sockets and ports will be, and what they look like. There will be some slight variations in location of sockets and features between different motherboards but most will follow this general layout pattern.

Motherboard Sockets

Almost every motherboard will have a standard set of sockets. More advanced boards may have additional sockets and older boards may have fewer, but these are the essential ones.



BACK PANEL CONNECTIONS |

PS/2 Keyboard/Mouse Port
Use this port to connect a PS/2 mouse or keyboard.

USB 3.0/2.0 Port
The USB 3.0 port supports the USB 3.0 specification and is compatible with the USB 2.0/1.1 specification. Use this port for USB devices.

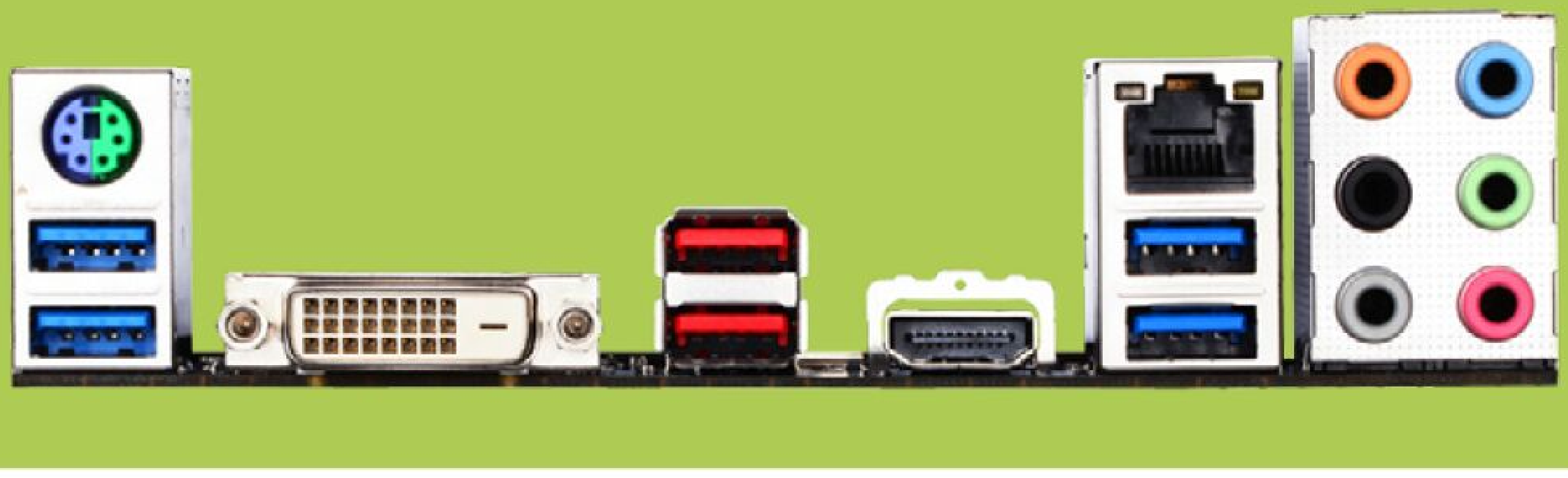
DVI-D Port
The DVI-D port conforms to the DVI-D specification and supports a maximum resolution of 1920 x 1200 @60Hz. The actual resolutions supported depend on the monitor being used. Connect a monitor that supports DVI-D connection to this port.

HDMI Port
The HDMI port is HDCP compliant and supports Dolby True HD and DTS HD Master Audio formats. It also supports up to 192KHz/16bit 8-channel LPCM audio output. You can use this port to connect your HDMI supported monitor. The maximum supported resolution is 4096x2160@24 Hz but the actual resolutions supported are dependent on the monitor being used.

LAN Port
The Gigabit Ethernet LAN port provides Internet connection at up to 1 Gbps data rate.

Multi-channel Audio Ports
These will be colour-coded to match the plugs on a 7.1 speaker set. Just connect each plug into the matching coloured ports.

Mic In (Pink)
The Microphone In jack is where you connect a stand microphone or plug the microphone jack of a gaming headset in.



1 - PCIE X16 SOCKET

The PCI Express specification allows for several different sizes of socket, depending on their intended use. Most modern graphics cards will require a PCIe x16 slot, as shown here, to run at their full potential. The x16 in the name refers to the number of lanes the socket allows i.e. the amount of information capable of being carried to and from the card installed. PCI Express x16 sockets normally have a small clip to hold large cards firmly in place.

2 - PCIE SOCKETS

A PCI Express card fits into a slot of its physical size or larger (with x16 as the largest used) but may not fit into a smaller PCI Express slot. For example, a x16 card won't fit into a x4 or x8 slot. Some slots use open-ended sockets to permit physically longer cards and negotiate the best available electrical and logical connection. The number of lanes actually connected to a slot may also be less than the number supported by the physical slot size.

3 - PROCESSOR SOCKET

The processor socket, whether for Intel or AMD CPUs, is normally in this approximate position and is fairly hard to miss. When you unbox your motherboard, this socket will have a plastic protective cover over it to prevent any of the pins or contacts being damaged. Intel and AMD processor sockets use slightly different ways of locking the CPU in place but each will have a lever that needs to be lifted to allow access.

4 - RAM SOCKETS

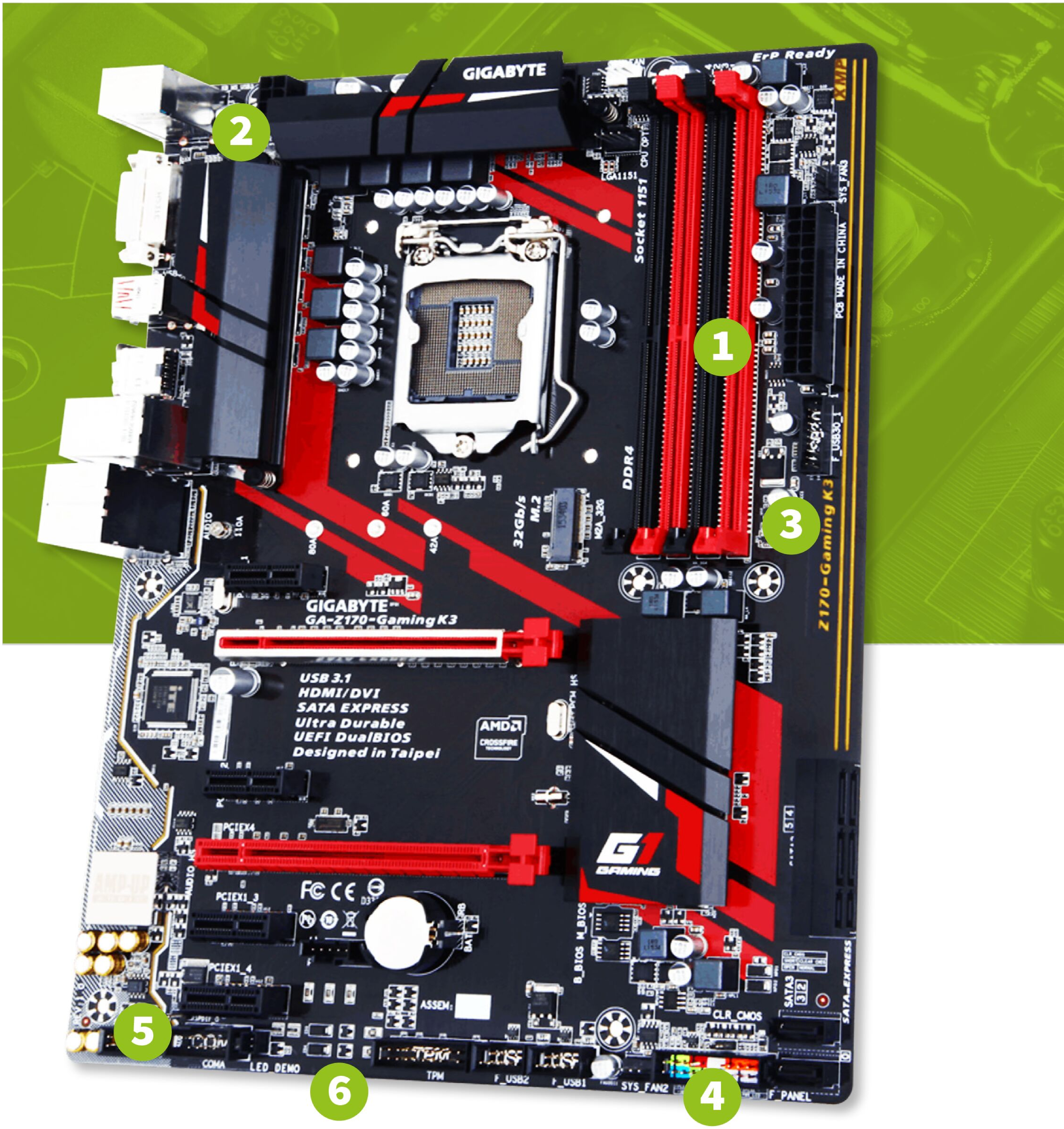
The actual number of SDRAM sockets your motherboard features can range from two to six, although 4 is the more likely number if you are using any type of gaming board. These will almost always be arranged in dual channels. Each channel pair is given a different colour or is marked on the motherboard itself. A matched pair of DIMMs should always be inserted into the same colour sockets if possible.

5 - SATA 3 SOCKETS

The SATA III interface, correctly known as SATA 6Gb/s, is the latest SATA interface running at 6Gb/s. The bandwidth throughput, which is supported by the interface, is up to 600MB/s. This interface is also backwards compatible with SATA II (3Gb/s) interface. Along with multiple SATA III sockets, your motherboard will normally feature SATA II as well. The SATA III sockets will often face towards the edge of the motherboard (as shown here), in the direction most drives will be.

6 - M.2 SOCKET

M.2, formerly known as the Next Generation Form Factor (NGFF), is a specification for internally mounted computer expansion cards (SSDs). Most solid state drives released within the last year or so have been too fast for the bus they're connected to. M.2 SSDs are normally designed to enable high performance storage in thin, power-constrained devices, such as ultrabooks. If you are using an SSD that is M.2-compatible, make sure you use this socket for the best speeds (up to 32GB/s).


2
1
3
5
6
4
GIGABYTE
GA-Z170-Gaming K3
USB 3.1
HDMI/DVI
SATA EXPRESS
Ultra Durable
UEFI DualBIOS
Designed in Taipei
Z170-Gaming K3
Socket 1151
DDR4
ErP Ready

1 - MAIN 24-PIN POWER

This is where you plug in the main power supply for the motherboard. The plug on your PSU will either be a single 24-pin, or will be made up of a 20-pin and a 4-pin plug that clip together to make a 24-pin. This is because some motherboards only require a 20-pin connector. This power supply socket is designed in such as way that the plug can only fit into it one way, and once fitted clips into place with a simple hook.

2 - CPU 8-PIN POWER

Somewhere close to the CPU socket you will see the 8-pin CPU power socket. Depending on the CPU range your motherboard is designed for, four of the holes on this socket may be covered with a sticker. The cable from the PSU will always be split into two 4-pin plugs, which can be clipped together to make an 8-pin plug. Always check how much voltage your CPU needs and use the plug as directed to avoid possible damage to the chip.

3 - USB 3.0 PORT

USB 3.0 is now pretty standard on most motherboards. The sockets to connect any front panel USB 3.0 ports to the motherboard will normally be positioned along the right-hand edge, closest to the front of the case (when the board is in place). There may also be an additional USB 3.0 connection socket along the bottom edge, to make it easier to connect any rear-facing USB expansion cards you might install. USB 3.0 sockets are normally numbered in order but it doesn't make any difference which you use.

4 - FRONT PANEL CONNECTOR

Alternatively referred to as the fpanel or system panel connector, this connects the front panel power button, reset button and LEDs to the motherboard. The System panel cables are two wire cables that are colour coded to help identify where they connect to the motherboard connector. The black or white wire is the ground (GND) wire and the coloured wire is the powered wire. The cables, colours and connections vary depending on the computer case and motherboard you have.

5 - HD AUDIO CONNECTOR

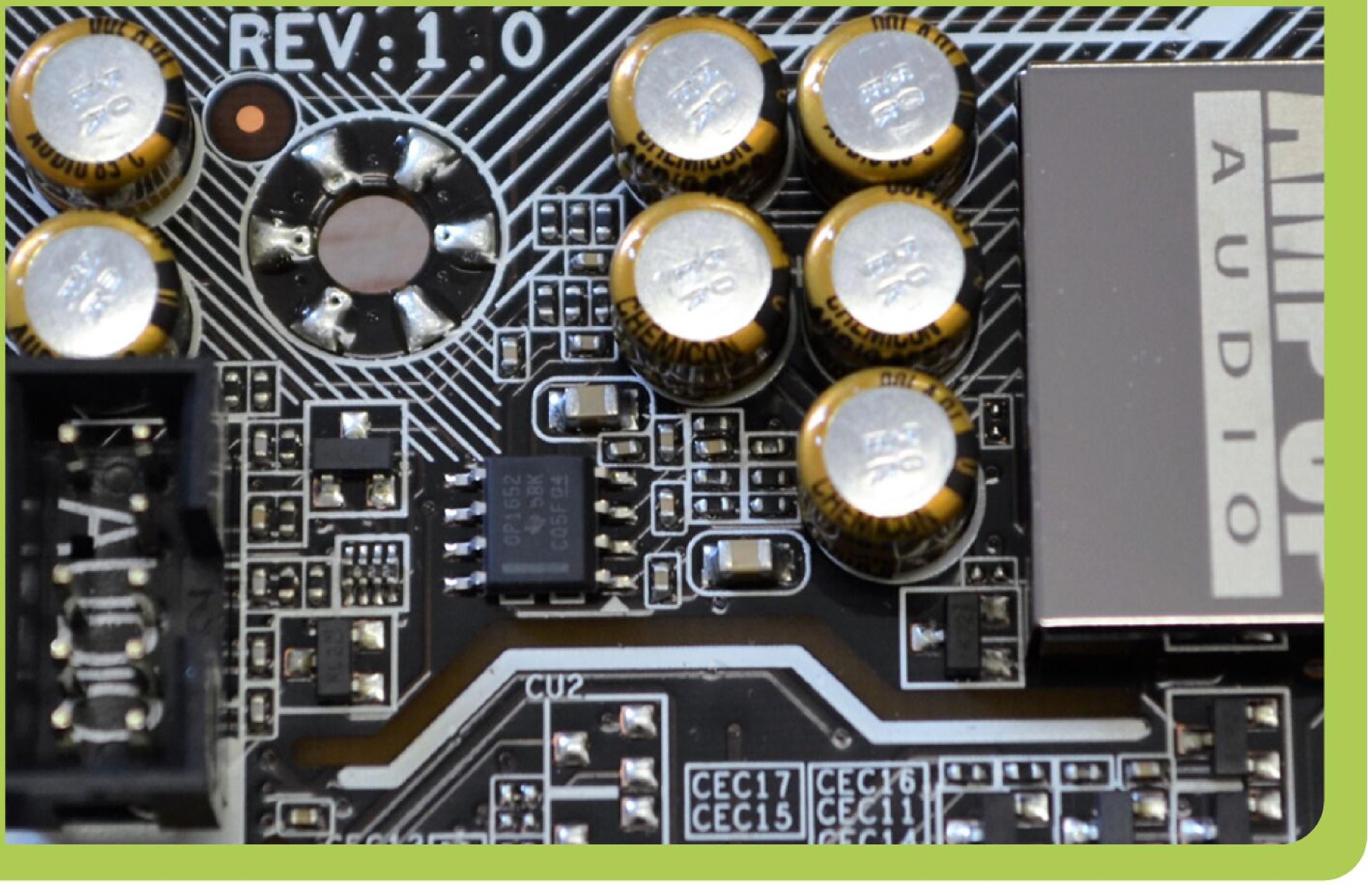
This is another connector for front panel ports, this time the audio ports (microphone and headphone). If you plan to install an audio expansion card into your PC, you may be required to connect to this socket as well as the PCI socket. Depending on where it is positioned on the motherboard and the length of cable, you may need to use an extension to make it reach. These are sometime supplied with the case or can be found cheaply online.

6 - COM, TPM AND USB 2 SOCKETS

It is fairly unlikely that you will need to use any of these connectors, and almost certain that you won't need the TPM and COM connectors. A TPM (Trusted Platform Module) can securely store keys, digital certificates, passwords and data. If you are worried about security, you can buy one quite cheaply. COM ports are traditionally hardware Serial ports that were generally used for Keyboard & mouse. Motherboards tend to still include them for legacy purposes.

MOTHERBOARD REVISION NUMBER |

Even with a newly purchased motherboard, you might need to update the BIOS or drivers. Before you do, you should check your motherboard revision number. The revision number on your motherboard looks something like: "REV: X.X." For example, "REV: 1.0" means the revision of the motherboard is 1.0.



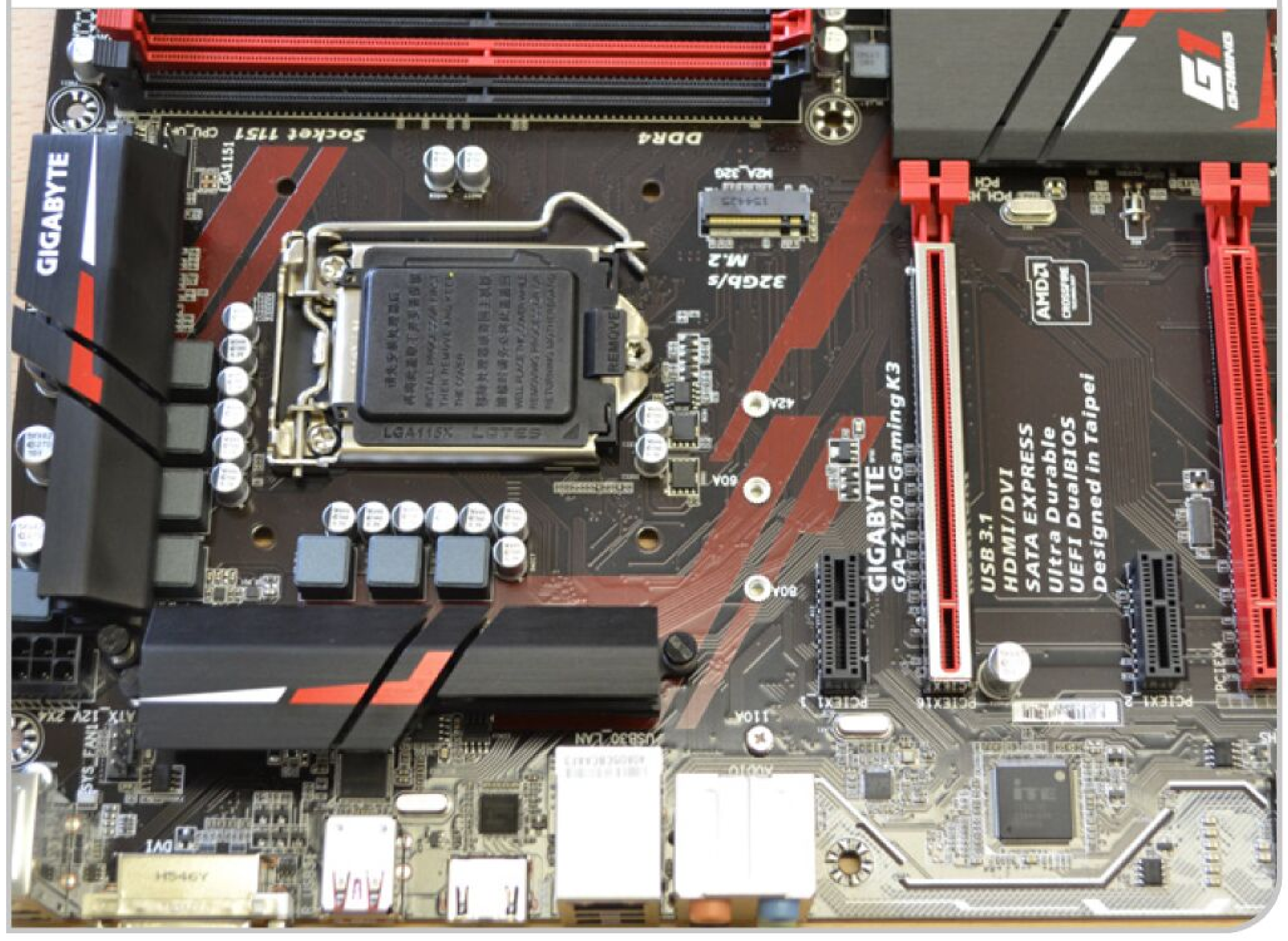
Fitting the CPU

The CPU, or Central Processing Unit, is the brain of your computer and is one of the key areas where you should try to get as much bang for your buck as possible. The processor is generally one of the most expensive single components, so installing it safely and correctly first time is important. Almost as important is how you plan to keep the processor running smoothly after installation, which we will cover in detail over the next few pages.

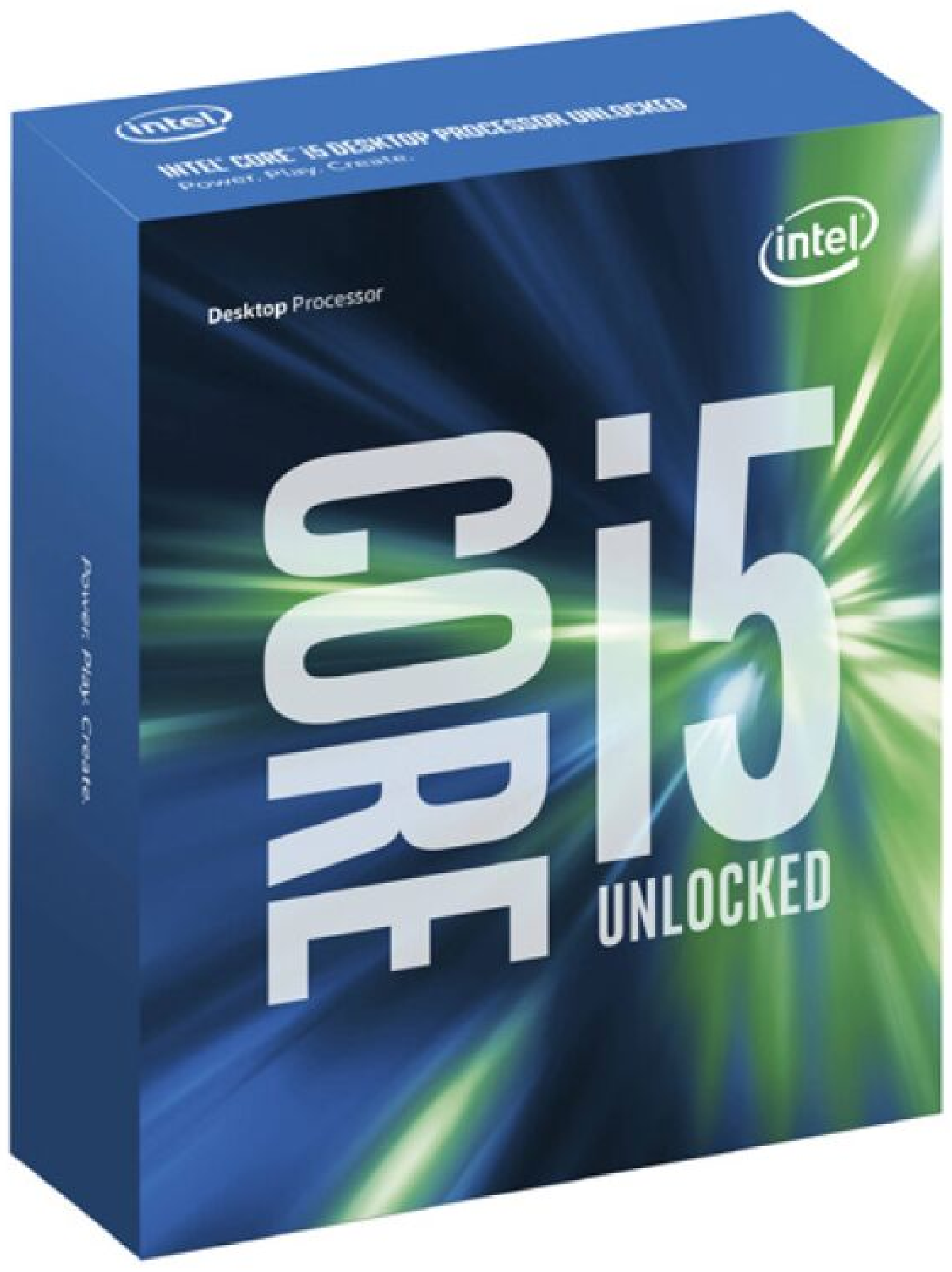
The Central Processing Unit

This is the first part of the build where things can go wrong if you are not very careful. Always handle the CPU with great care and take your time when fitting.

STEP 1 Fitting the CPU in to the motherboard socket is usually best done before the motherboard is fitted into the case, as is fitting the CPU Cooler and RAM, as this allows for greater control. The CPU is a small and delicate component, so making installation as easy as possible makes sense. Even if you take anti-static precautions at no other time during the build, do so for this part.


GIGABYTE
Socket 1151
DDR4
M.2
32Gb/s
GIGABYTE GA-Z170-Gaming K3
USB 3.1
HDMI/DVI
SATA EXPRESS
Ultra Durable
UEFI DualBIOS
Designed in Taipei

STEP 2 The process for fitting an AMD or Intel CPU is similar, but there are some physical differences between the two processor types, not least the arrangement of the contact pins. We are using an Intel Core i5 6600k CPU for our build and we will concentrate on that process. See further down the guide to see specific AMD CPU installation advice and precautions.

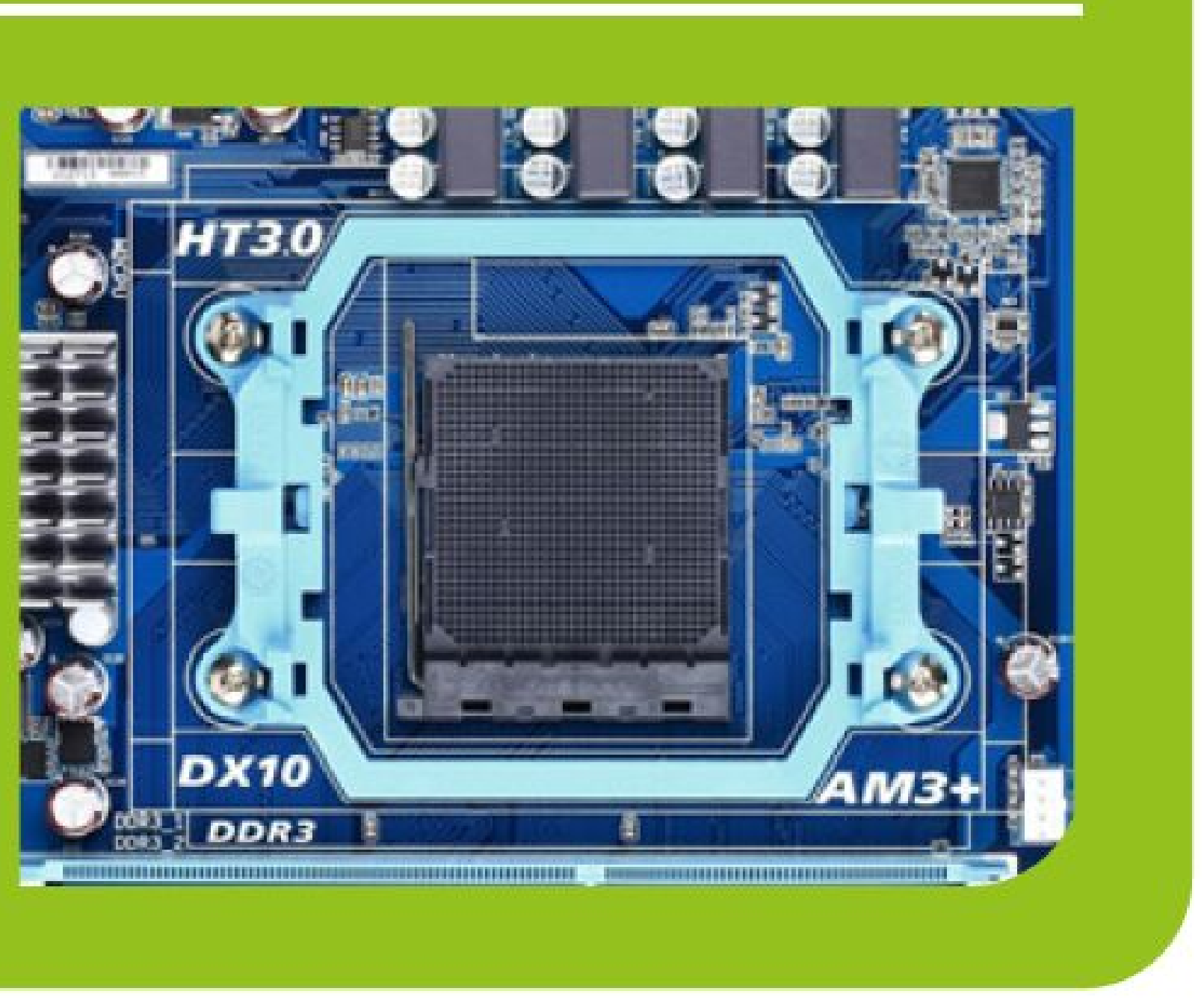

intel
INTEL CORE i5 DESKTOP PROCESSOR UNLOCKED
Desktop Processor
CORE i5
UNLOCKED

AMD PROCESSORS

Intel processors are often the first choice for PC builders but AMD CPU's can be a good option for many people due to their lower cost.

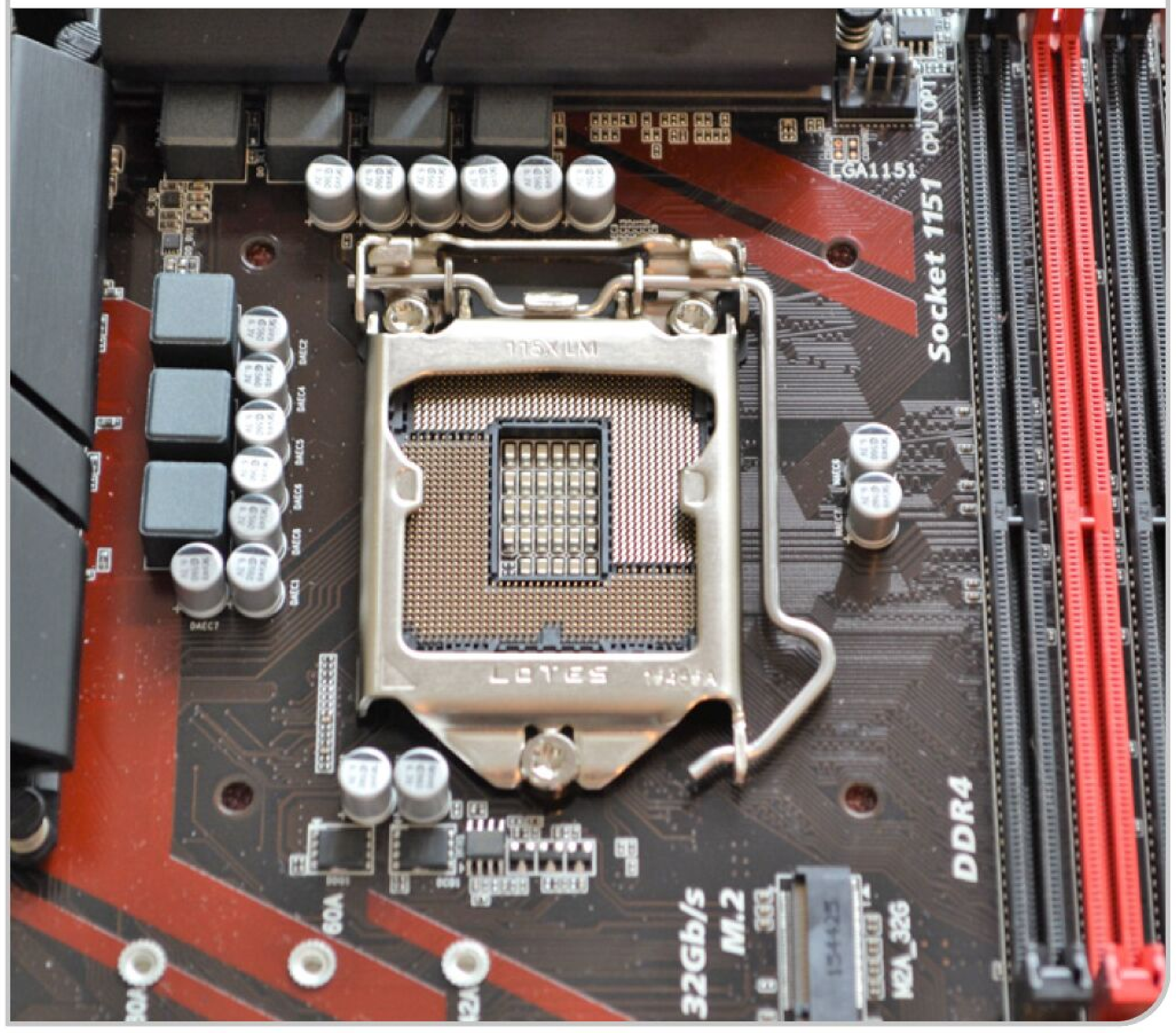
The main way that AMD processors physically differ from Intel processors is that they have the pins on the chip, whereas Intel has the pins on the motherboard socket. Just as with Intel processors, you can use the arrow in the corner to orientate the chip correctly.

Instead of dropping the AMD chip in flat, you need to hook the edge under the lip and then lay it down so that it sits flat. Use the notches to line it up in the socket. The locking bar can then be pressed down into place to firmly hold the CPU in position.


HT3.0
DX10
AM3+
DDR3

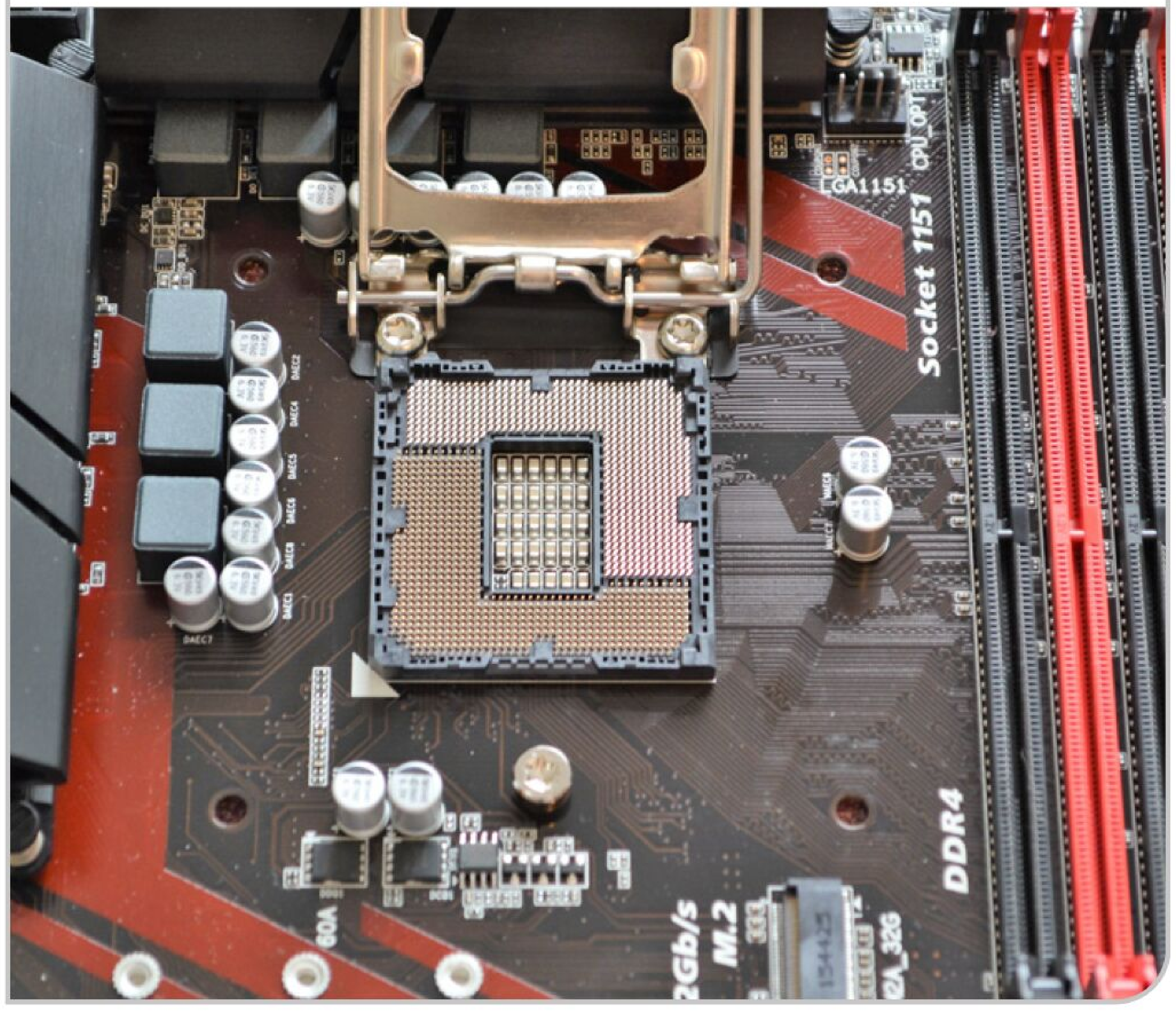
STEP 3

With your motherboard carefully placed on a flat surface, a thin sheet of anti-static foam beneath the motherboard will help to stop it moving or being damaged, and positioned so that the locking lever on the CPU socket is pointing towards you, carefully take the processor out of its box. Only ever touch the CPU on the sides, never touch the contacts on the underside.



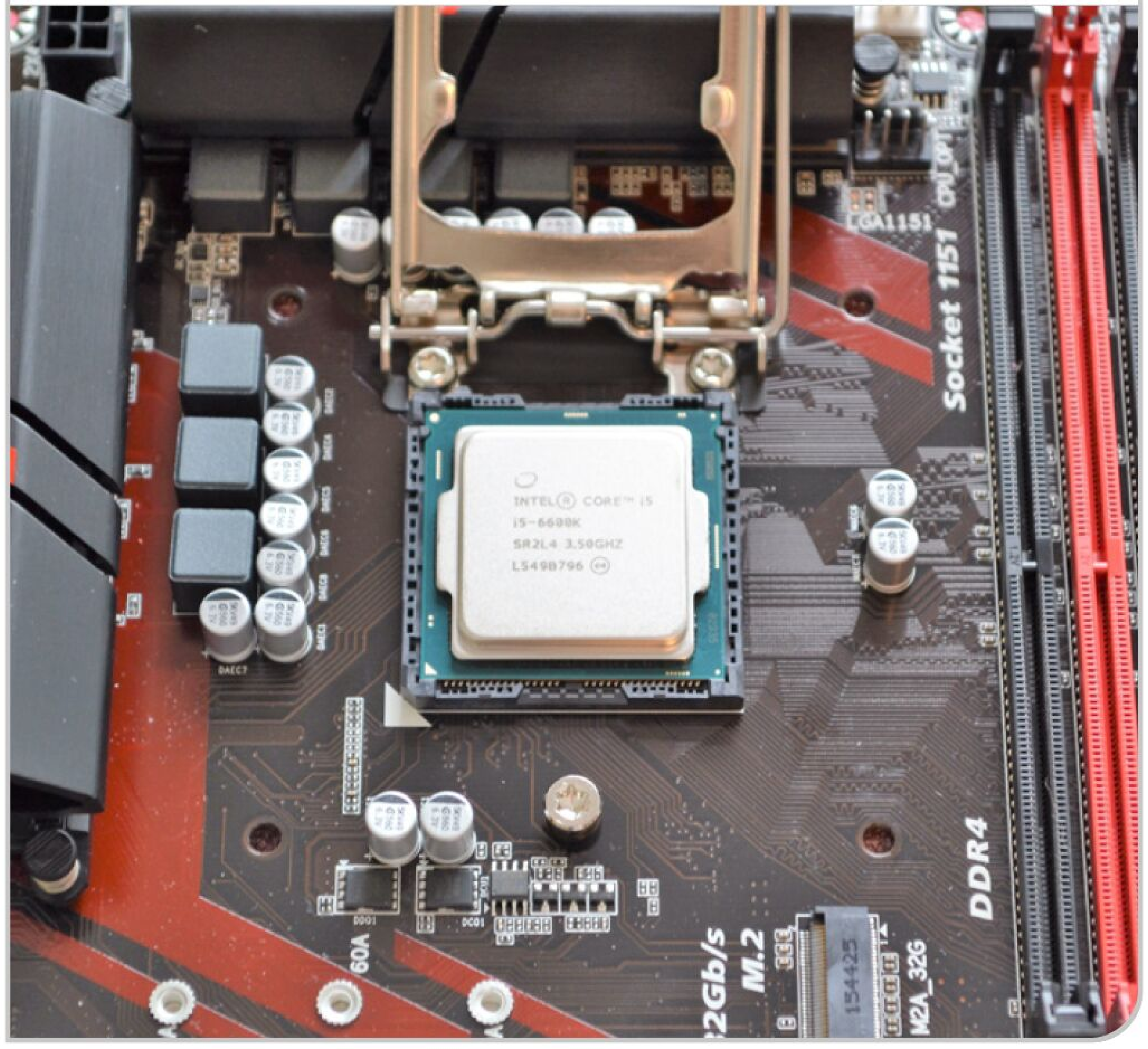
STEP 4

Carefully release the locking bar on the socket and lift it up. This will slide the processor lock back and hinge it up out of the way. Leave the plastic socket cover on for the moment. Take a close look at the now visible CPU socket and you will see a small arrow in the bottom left corner. If you look on the CPU itself, you will see that it also has a small arrow in one corner.



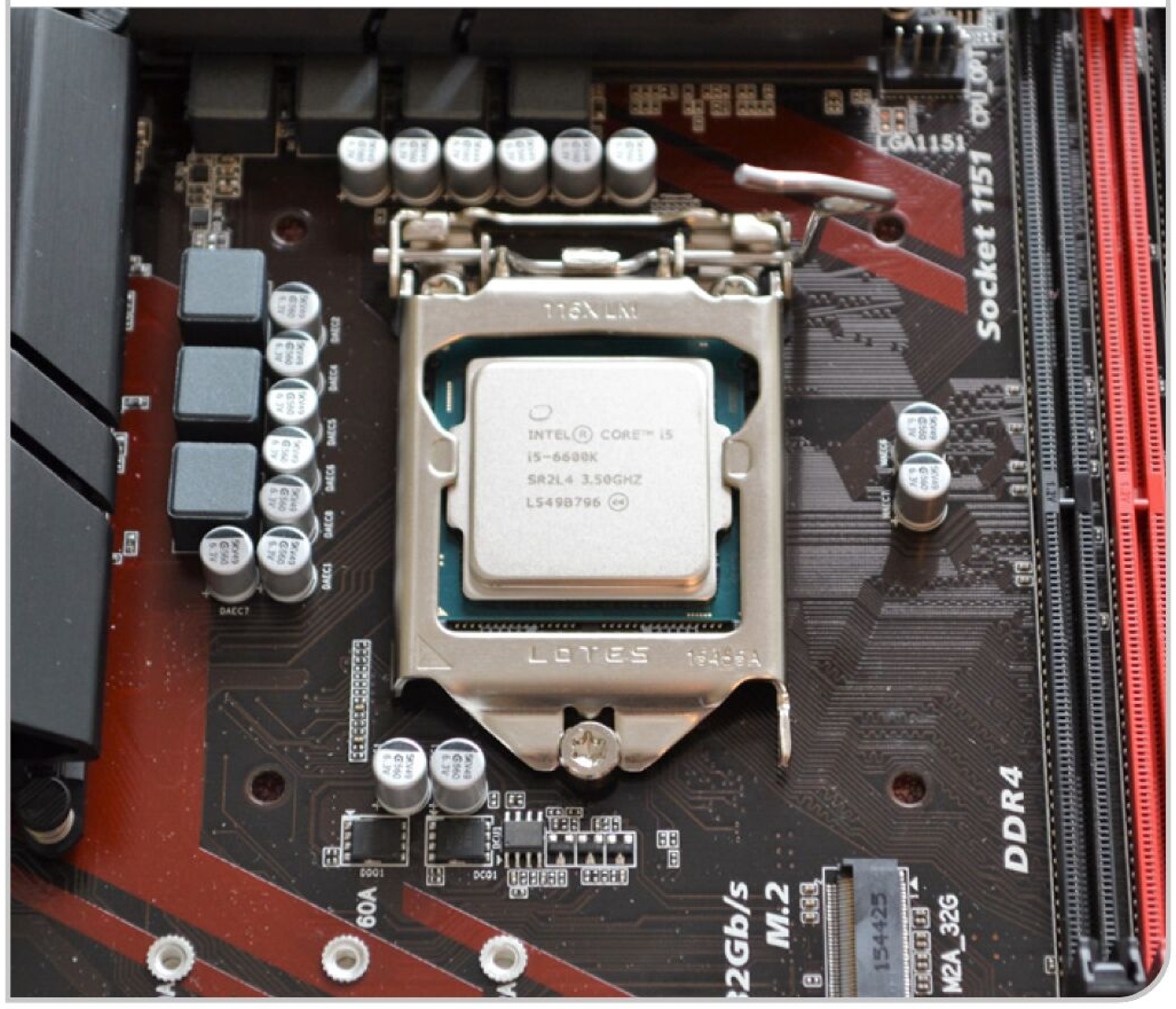
STEP 5

The arrow shows you which way the chip sits in the socket (arrow to arrow). Intel processors also have a small indentation on each edge, which further helps you to line it up in the socket. Holding the CPU carefully by the edges, lower it it into place in the socket. Ensure it is seated correctly, with the arrows and the notches lined up and in place.



STEP 6

You can now remove the plastic cover on the CPU lock, lower it down over the seated CPU and slide it into position. The exact locking process may vary slightly, even between the Intel family of CPU's, but most will slide the locking frame under a metal plate or raised washer. Firmly press the locking bar into the locked position. Your processor is now safely installed onto the board.



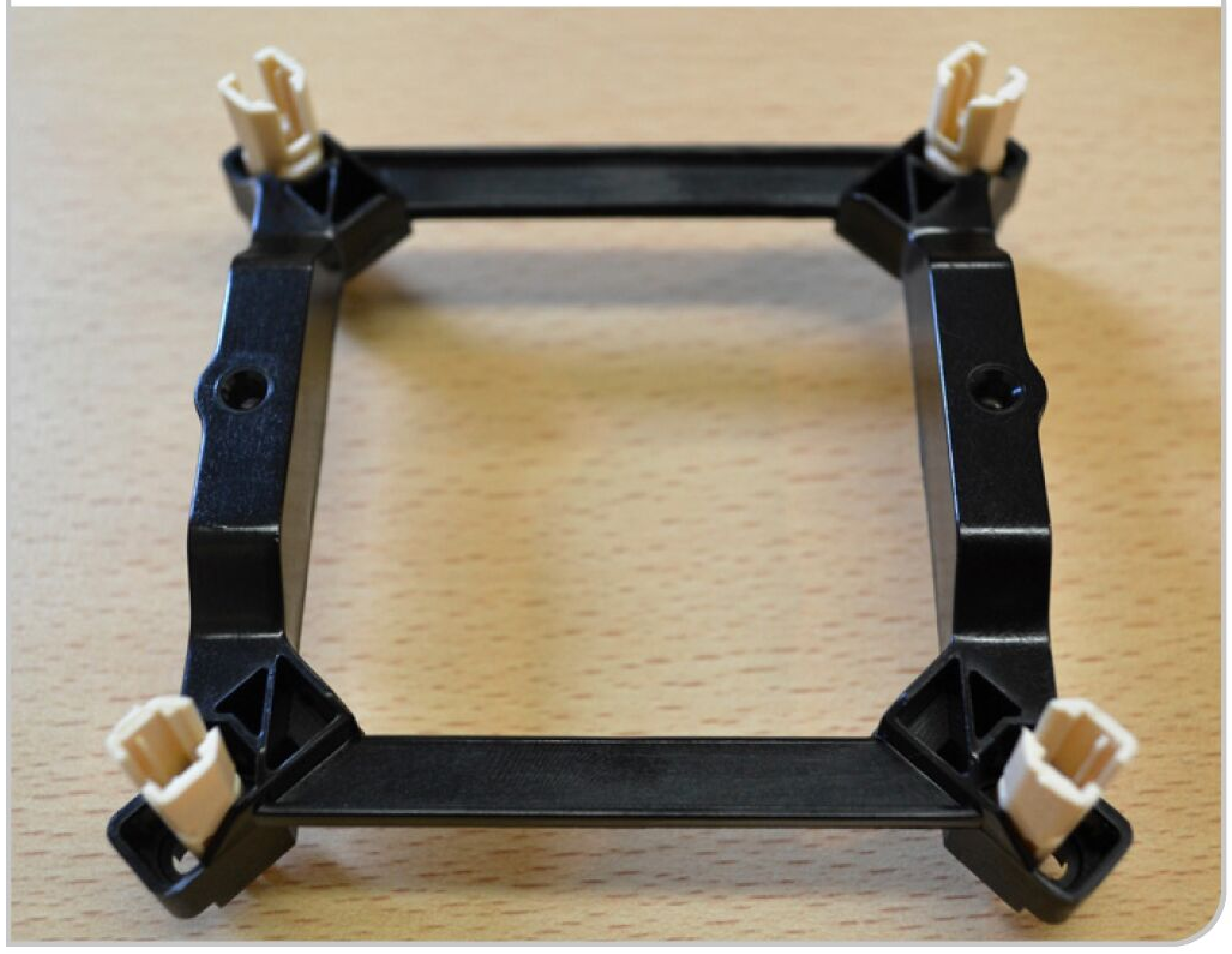
Adding a CPU Cooler

Depending on the processor you that bought, you may already have a stock CPU cooler. These are generally okay but not as efficient as many third-party coolers, particularly if you are planning on heavy workloads. Aftermarket coolers are not all that expensive and can really help with CPU heat reduction. For our build we are using an Arctic Freezer 7 Pro and most similar coolers will attach in the same way.

Air Cooling the CPU

Water cooling has become very popular over the last several years, but unless you are building a power gaming rig, air (heatsink) coolers are fine.

STEP 1 For Intel motherboards, the first thing you need to do is prepare the mounting plate. Place this face up on a flat surface and check the mounting holes in each corner. You should see that there are three possible positions for the mounting pins (for the different Intel CPU sockets: 1150 etc.). Place the mounting pegs into the correct holes at each corner.

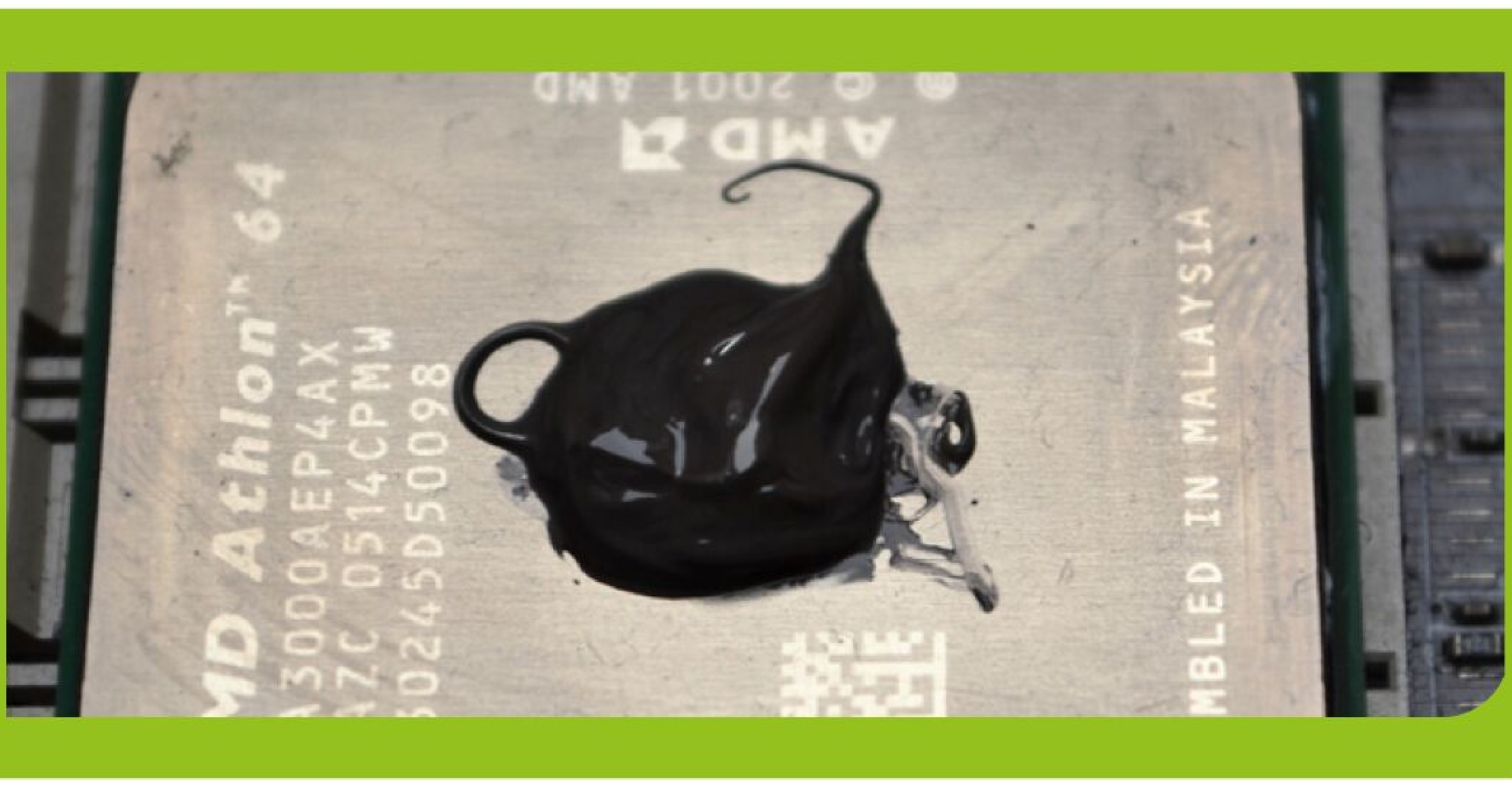


STEP 2 Carefully position the mounting plate on to the motherboard, lining up the pegs with the holes on the board, before pressing them through. This will see the mounting plate held loosely in position. You now need to push a pin into the mounting peg in each of the corners, pressing firmly down until you feel a slight click. The mounting peg is now held firmly in place.

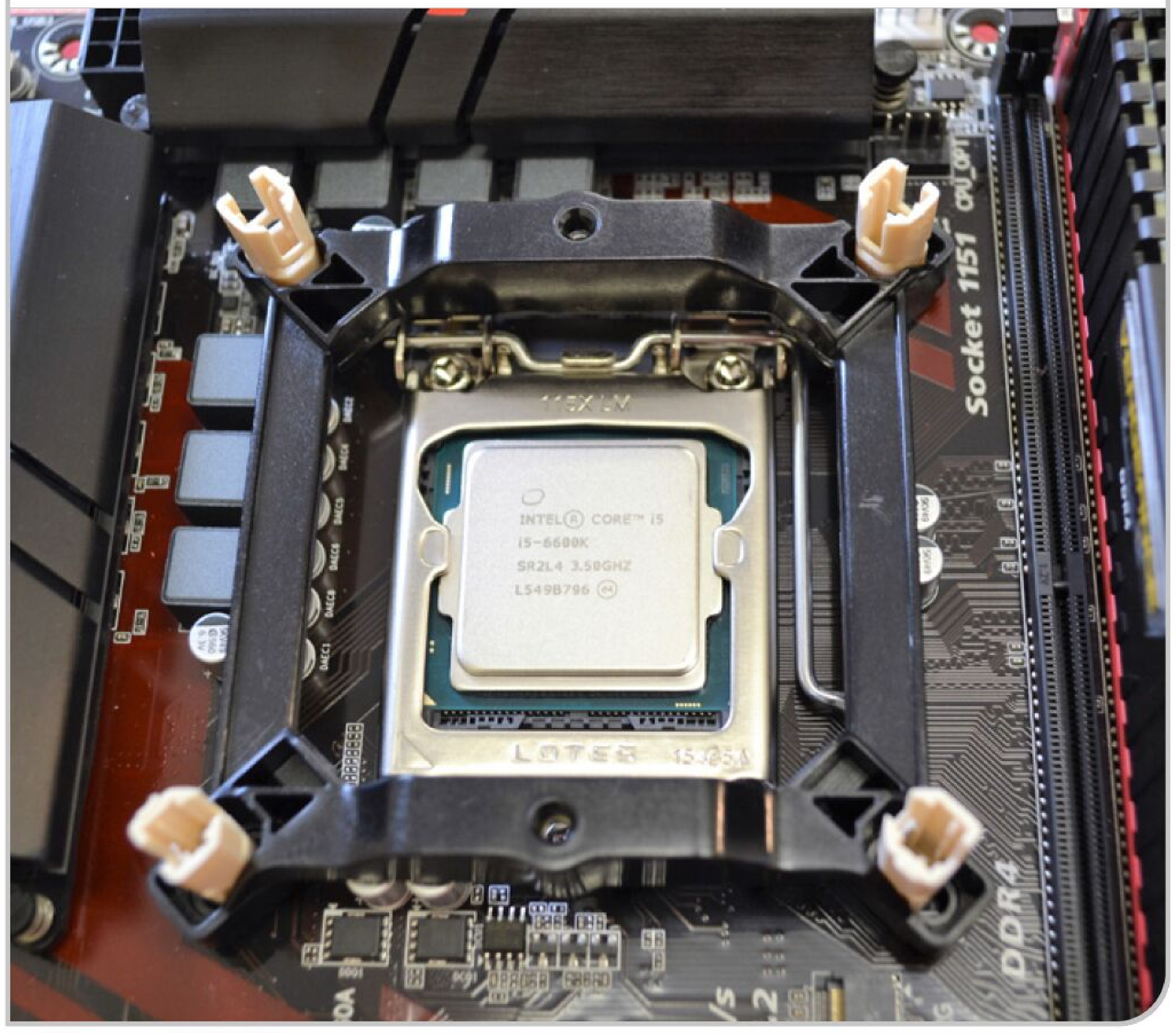
LGA1151
Socket 1151
DDR4

APPLYING THERMAL PASTE

To apply thermal paste yourself, squeeze a tiny amount, about half the size of a pea, on to the top of the CPU, right in the middle of the raised section. Use a clean credit card or similar implement to spread the paste out to the edges in an even layer, so that the top is completely covered.



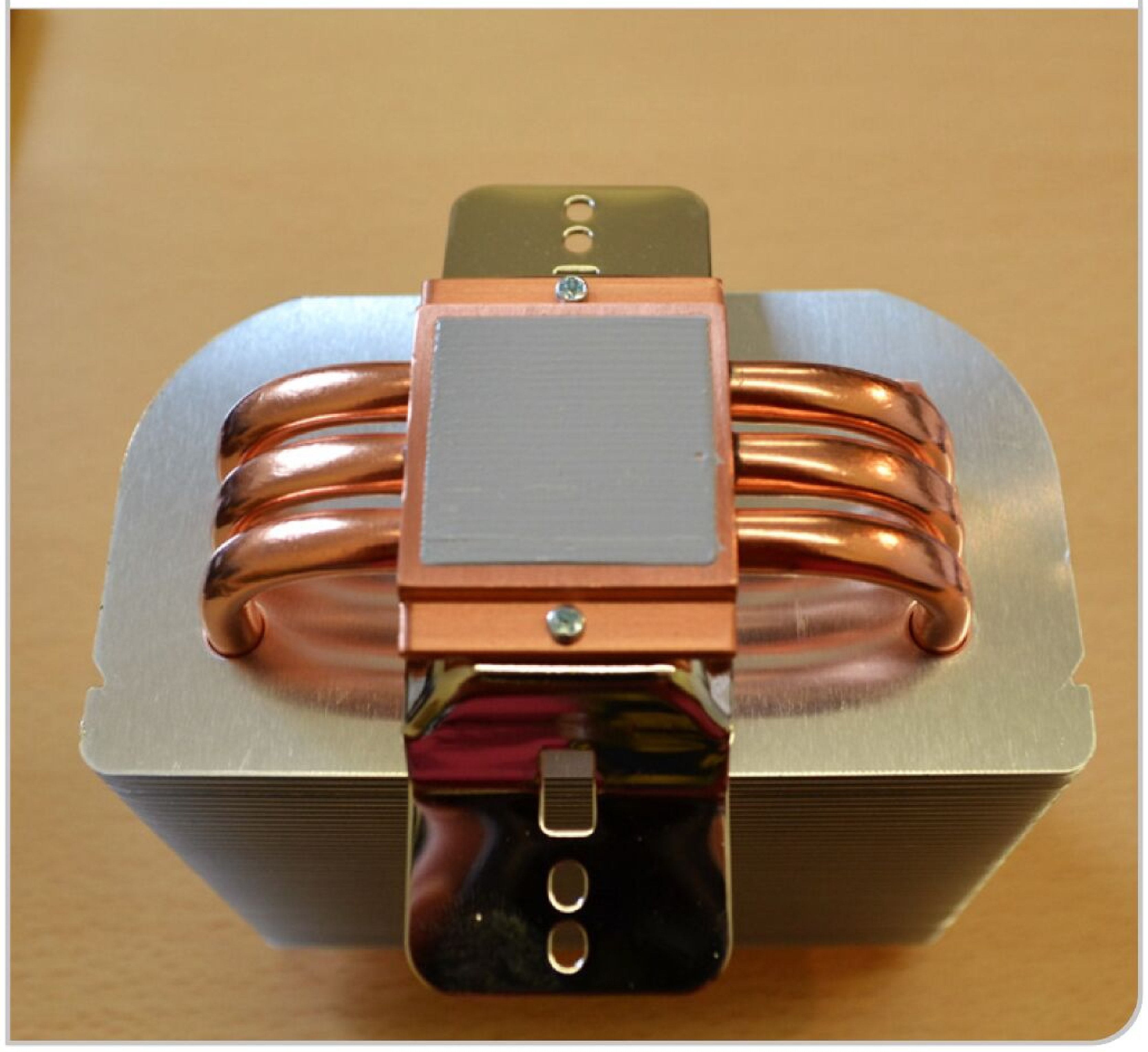
STEP 3 Repeat this for the other three corners of the mounting plate, until you have a firm fixture. If your CPU cooler has a fan on the side rather than on the top, as most stock coolers do, decide which way you want it to face. Our case has vents at the top, so we are choosing to face the fan upwards, away from the graphics card slot. Decide which makes more sense for your build.



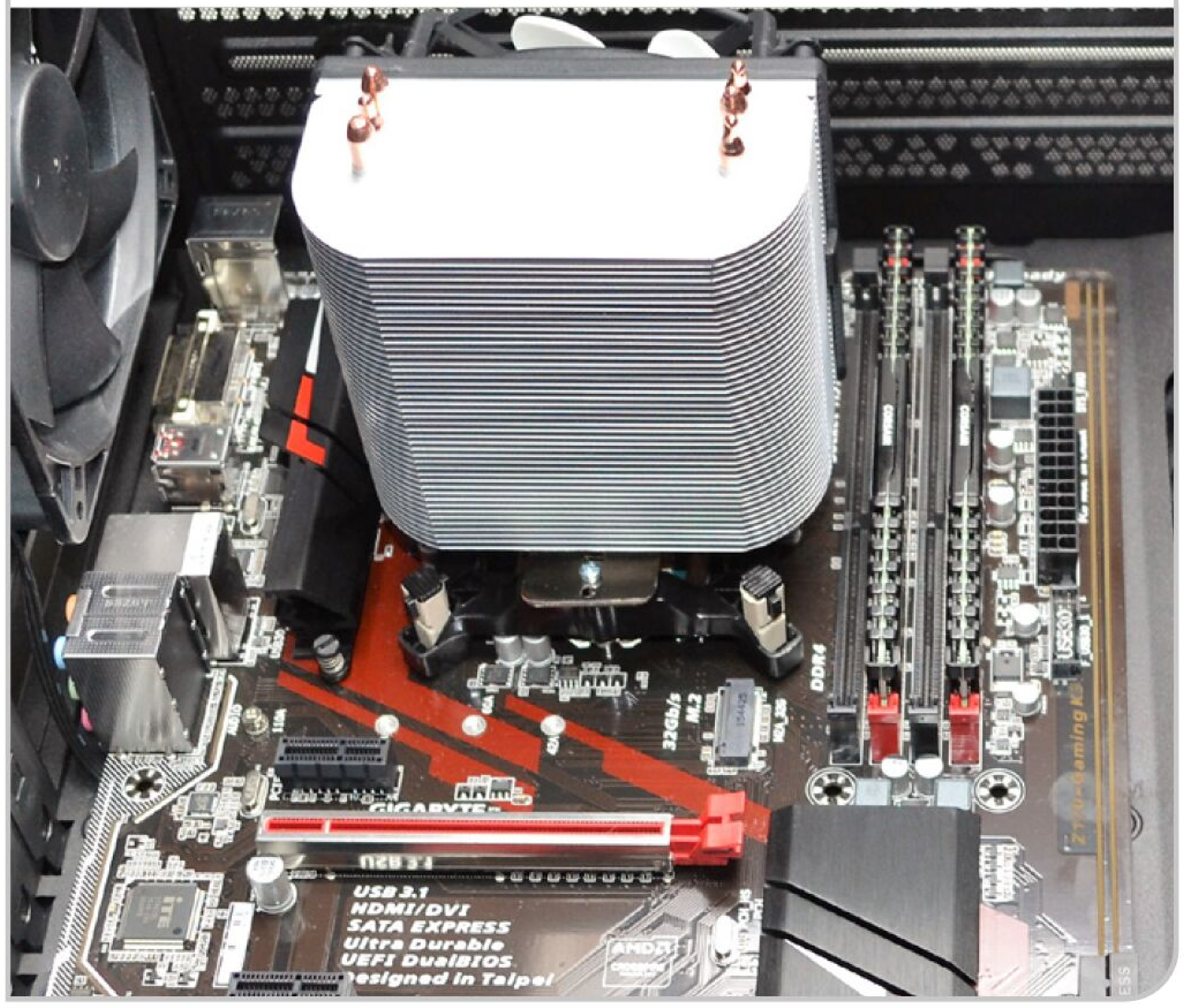
STEP 4 Before fitting the actual Freezer 7 cooler, we needed to remove the fan from it. Your cooler may not require this but many do as it helps give access to the screw fitting that secures the cooler to the mounting plate. The Freezer 7 fan simply clips on, so removing it is easy. If you remove the fan from your cooler before fitting it into place, make sure nothing will impede it.

Freezer
7 PRO
Rev.2
ARCTIC

STEP 5 There should always be a layer of thermal paste between the bottom of the CPU cooler heatsink and the CPU. Thermal paste helps to improve heat dissipation by filling the tiny gap between the heatsink and CPU. Our cooler has a layer of thermal paste pre-applied but not all do. You can buy thermal paste applicators cheaply online or at PC stores.



STEP 6 You can now carefully sit the CPU cooler on top of the CPU, ensuring that it is sitting level and use the supplied screws or other fixings to secure it in place. This step is quite an important one to get right first time, as trying to remove it and then clean up thermal paste is a chore. As you apply slight, even pressure, the thermal paste will spread to fill the gap.



Fitting the Memory Modules

The DIMM's, or Dual In-line Memory Modules, are modules that contain several RAM or SDRAM chips on a small circuit board. Most motherboards will have multiple memory module sockets, usually arranged in pairs. When you buy memory modules, they are usually sold as a matched pair; this ensures that they have the same latency, or in other words the same memory reaction time.

Installing the SDRAM

The RAM modules you will be fitting are quite robust but even so, they should be handled with care and without ever touching the metal contacts along the bottom.

STEP 1 How you fit the memory into the motherboard sockets depends on how many matched modules you are installing. A single 8GB module will almost always go into socket 1, unless otherwise advised in your motherboard instruction manual, but if you have multiple modules and multiple sockets, the choice is not always so obvious.

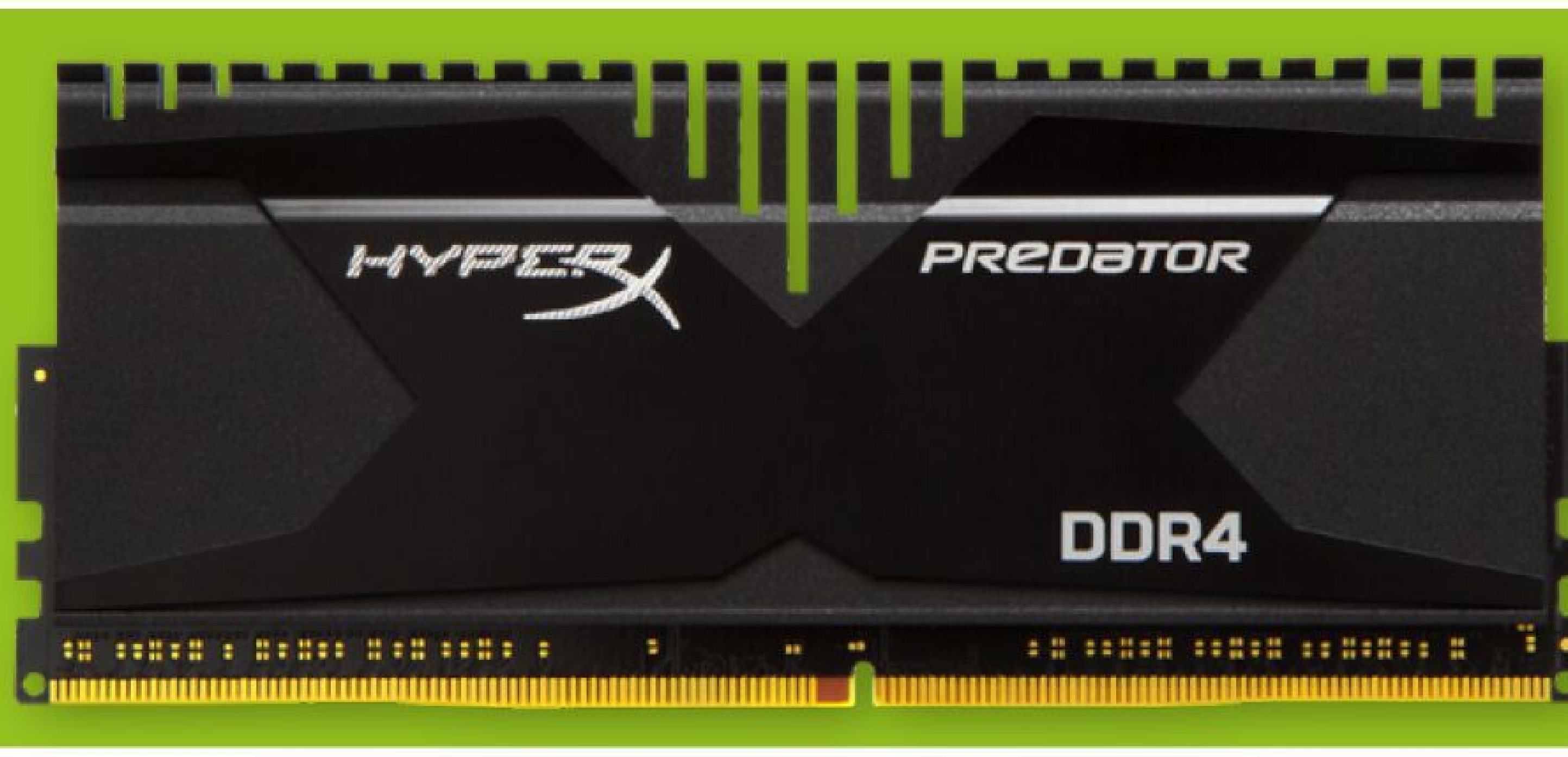
HYPERX
FURY

STEP 2 If your motherboard supports multiple memory channels and has more than two sockets, it is worth considering buying, for example, two 4GB matched modules, rather than a single 8GB module. Although the single 8GB might be more efficient, two 4GB DIMMS give you more flexibility, assuming identical latency range etc..

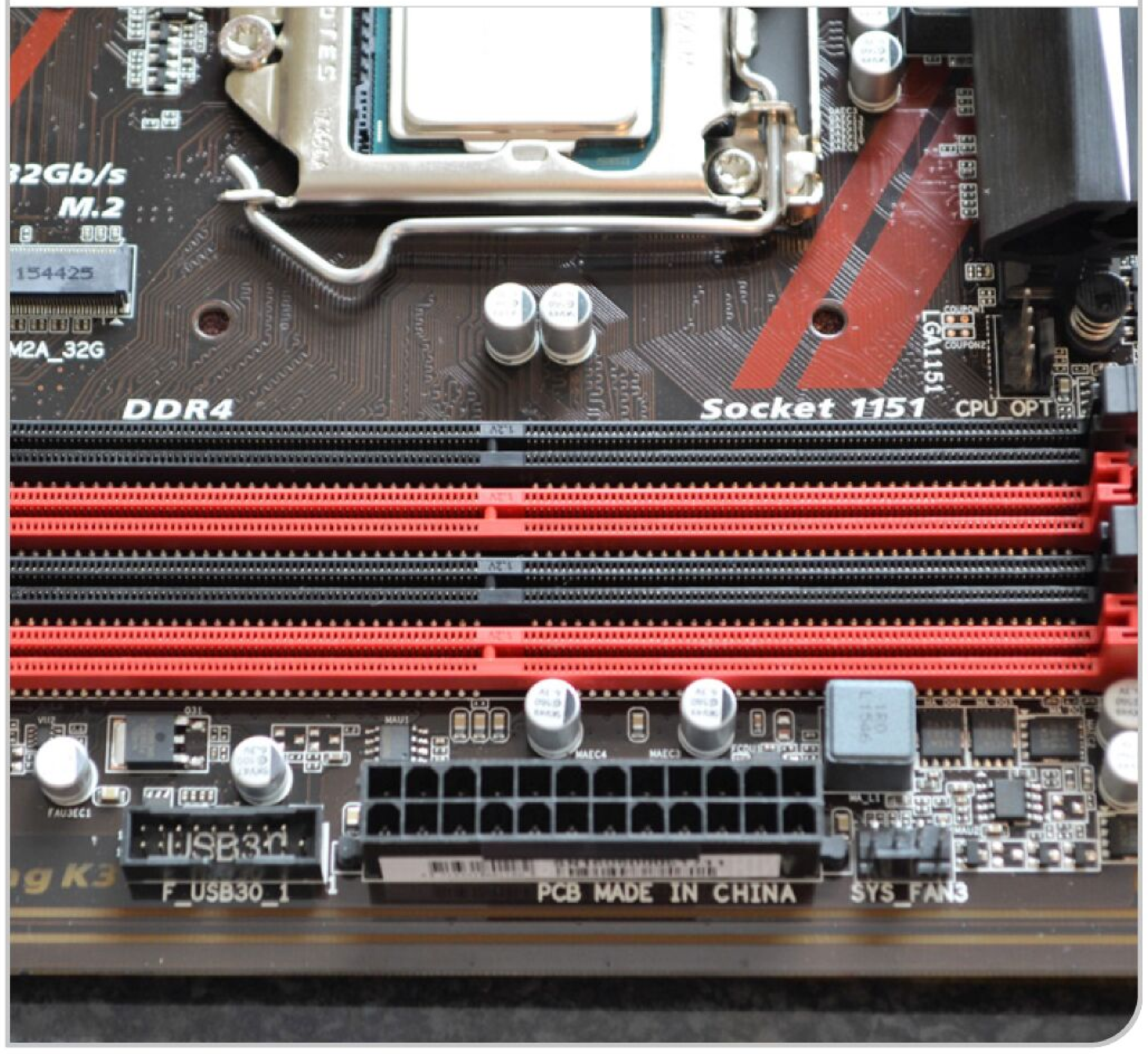
VENGEANCE LED

DDR4 MEMORY |

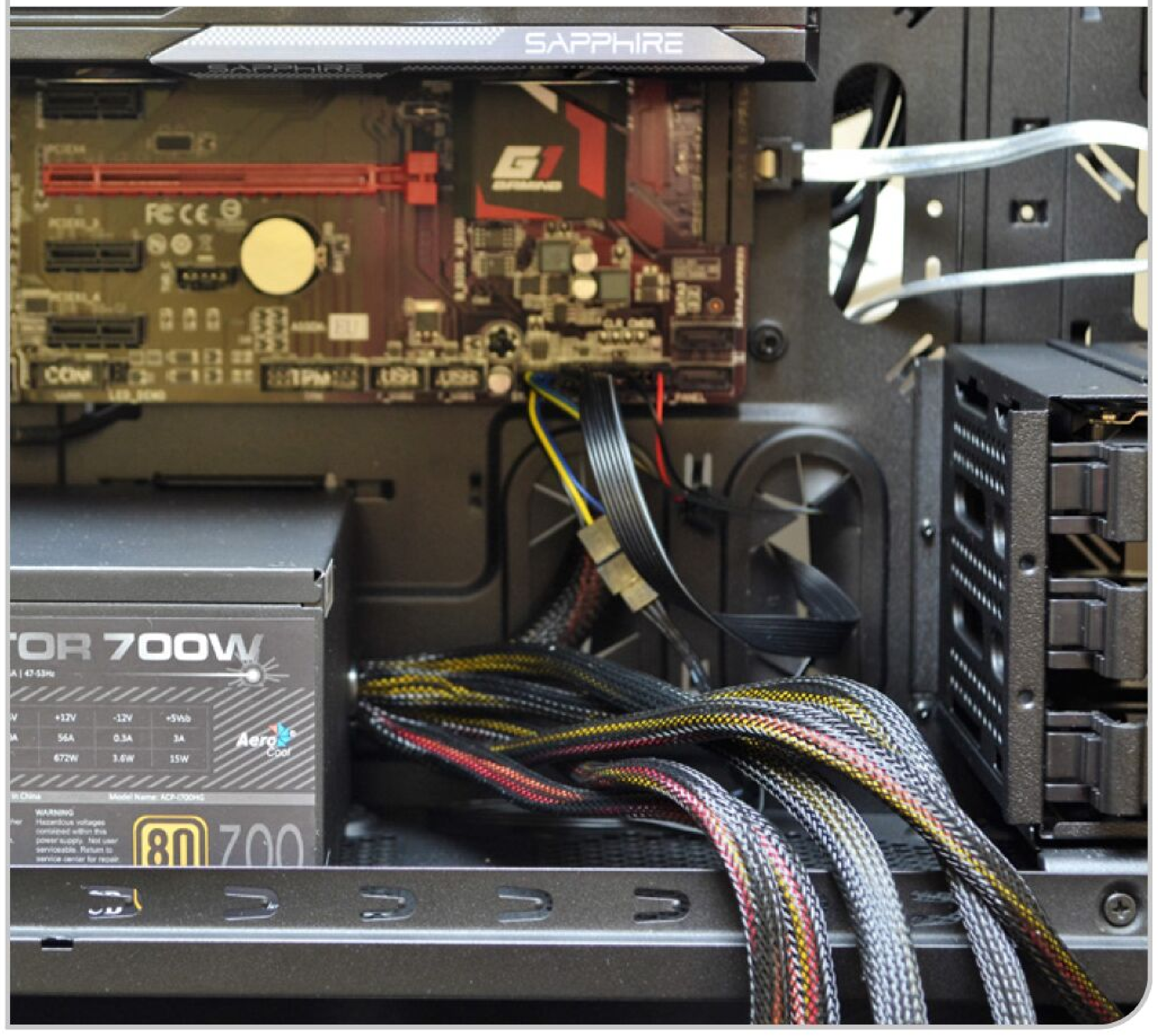
Released to the market in 2014, DDR4 is one of the latest variants of dynamic random-access memory (DRAM), some of which have been in use since the early 1970s. It's a higher speed successor to DDR2 and DDR3 but is not compatible with any earlier type of random access memory (RAM) due to different signalling voltages, physical interface and other factors. If you want to use it, make sure your motherboard supports it.



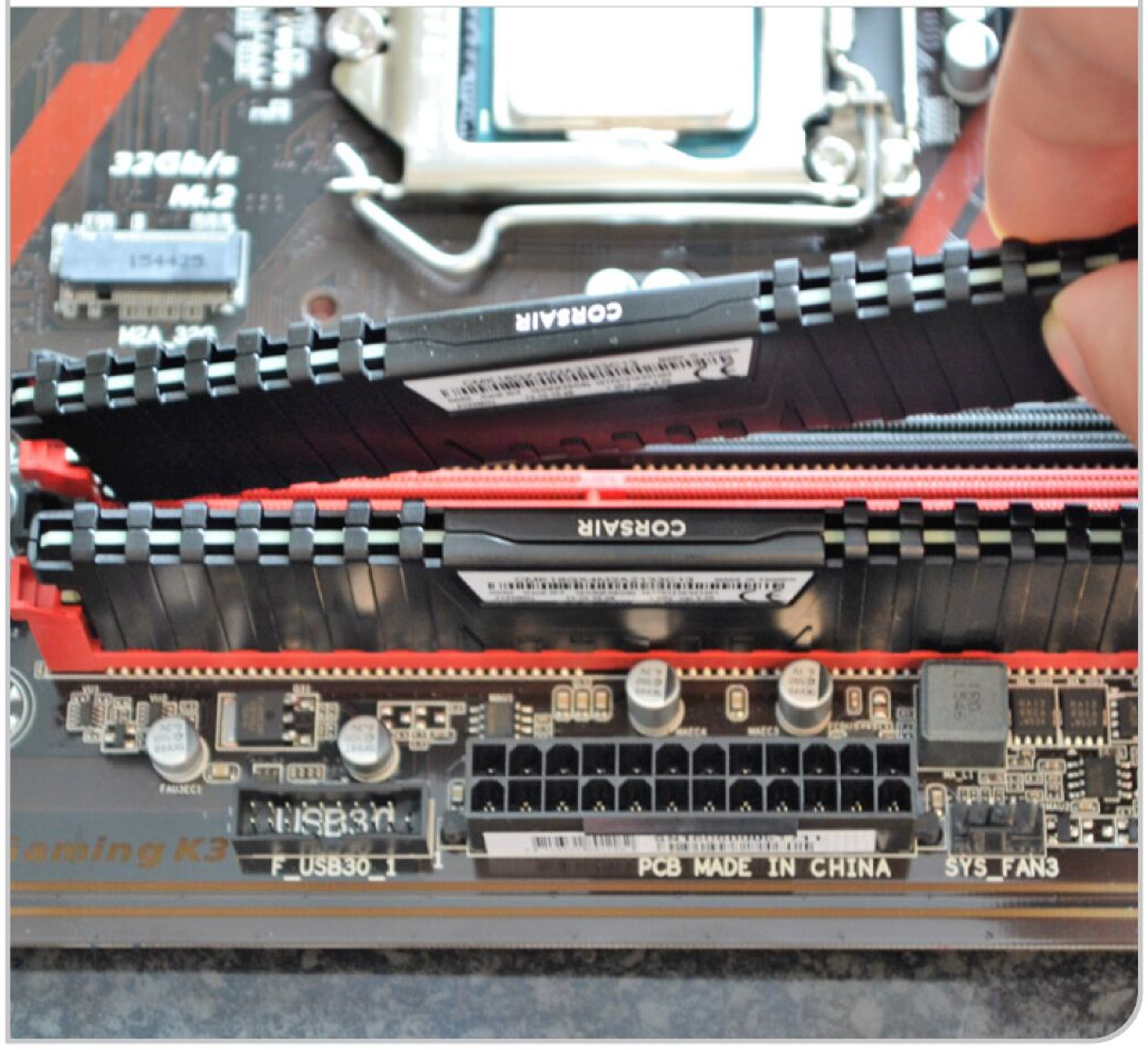
STEP 3 On many motherboards with four or more memory sockets, they will be colour-coded to show the different memory channels, as is the case with our Gigabyte motherboard. A single matched pair of modules would be fitted into socket 1 and 3. If you had a second matched pair, these would then go into sockets 2 and 4.


32Gb/s
M.2
M2A_32G
LGA1151
DDR4
Socket 1151
CPU_OPT
USB30
F_USB30_1
PCB MADE IN CHINA
SYS_FAN3

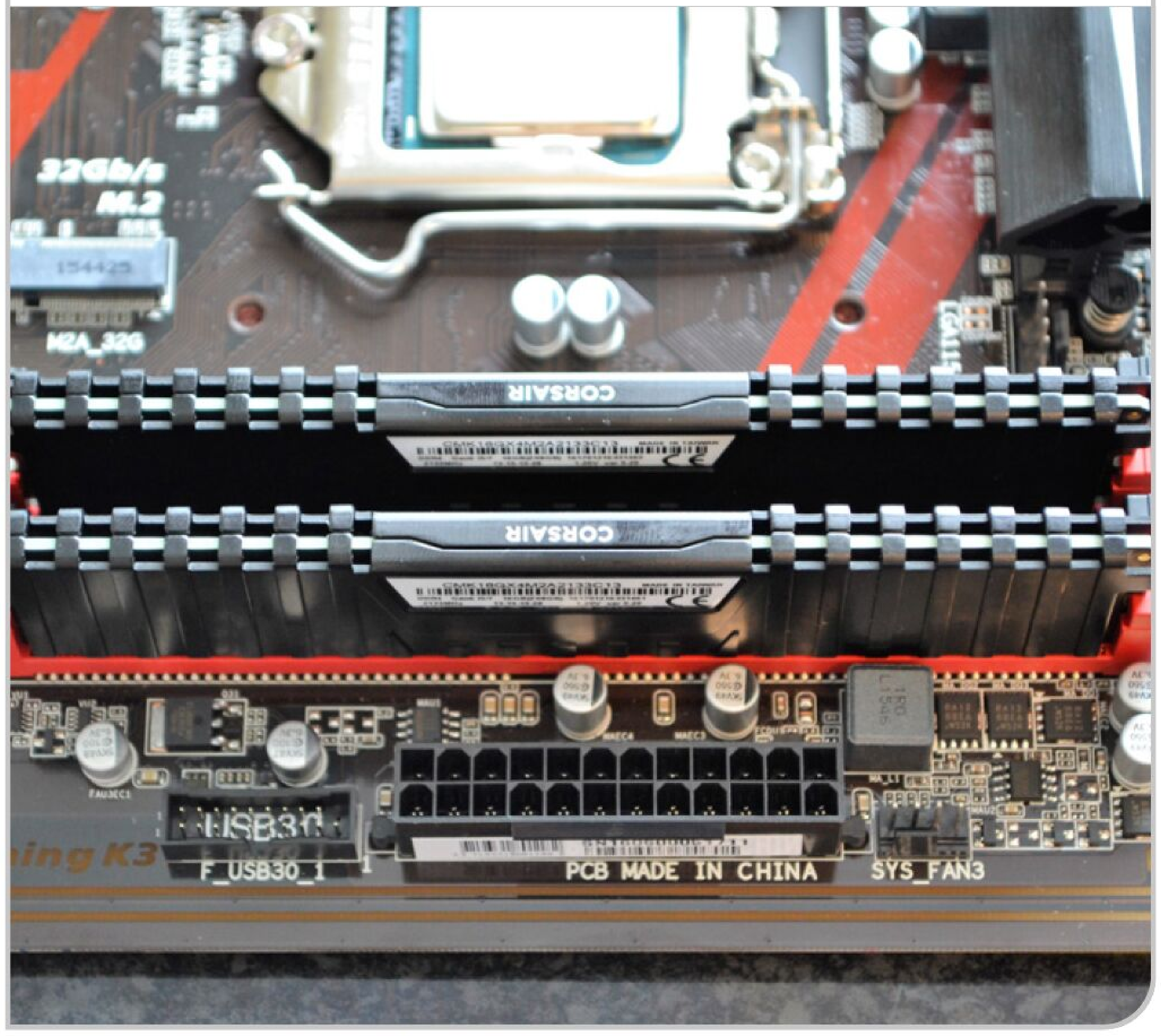
STEP 4 Memory modules have an offset notch in the row of connectors on the bottom. This will correspond with a divider in the motherboard memory socket, ensuring that you can't insert the DIMM the wrong way around. The memory socket will also usually have a hinged clip at each end that needs to be pressed down and away from the socket.


SAPPHIRE
G1
700W
80 700

STEP 5 Hold the module at a slightly diagonal angle, so that one end slots into the socket first. Ensure that it is pressed up against the end of the socket and then lower the other end into place. Press firmly and evenly on the top of the module to seat it into the socket. The hinged clips at either end will close, locking the DIMM firmly into place.


32Gb/s
M.2
CORSAIR
CORSAIR
F_USB30_1
PCB MADE IN CHINA
SYS_FAN3

STEP 6 Repeat the process to fit the second DIMM of your matched pair, if fitting a matched pair or set of four modules. Give each module a firm push on its top edge to ensure that they are all seated snugly. Adding RAM is one of the cheapest and easiest ways of increasing PC speed and even non-gamers should aim for at least 8GB to start.


32Gb/s
M.2
M2A_32G
CORSAIR
CORSAIR
F_USB30_1
PCB MADE IN CHINA
SYS_FAN3

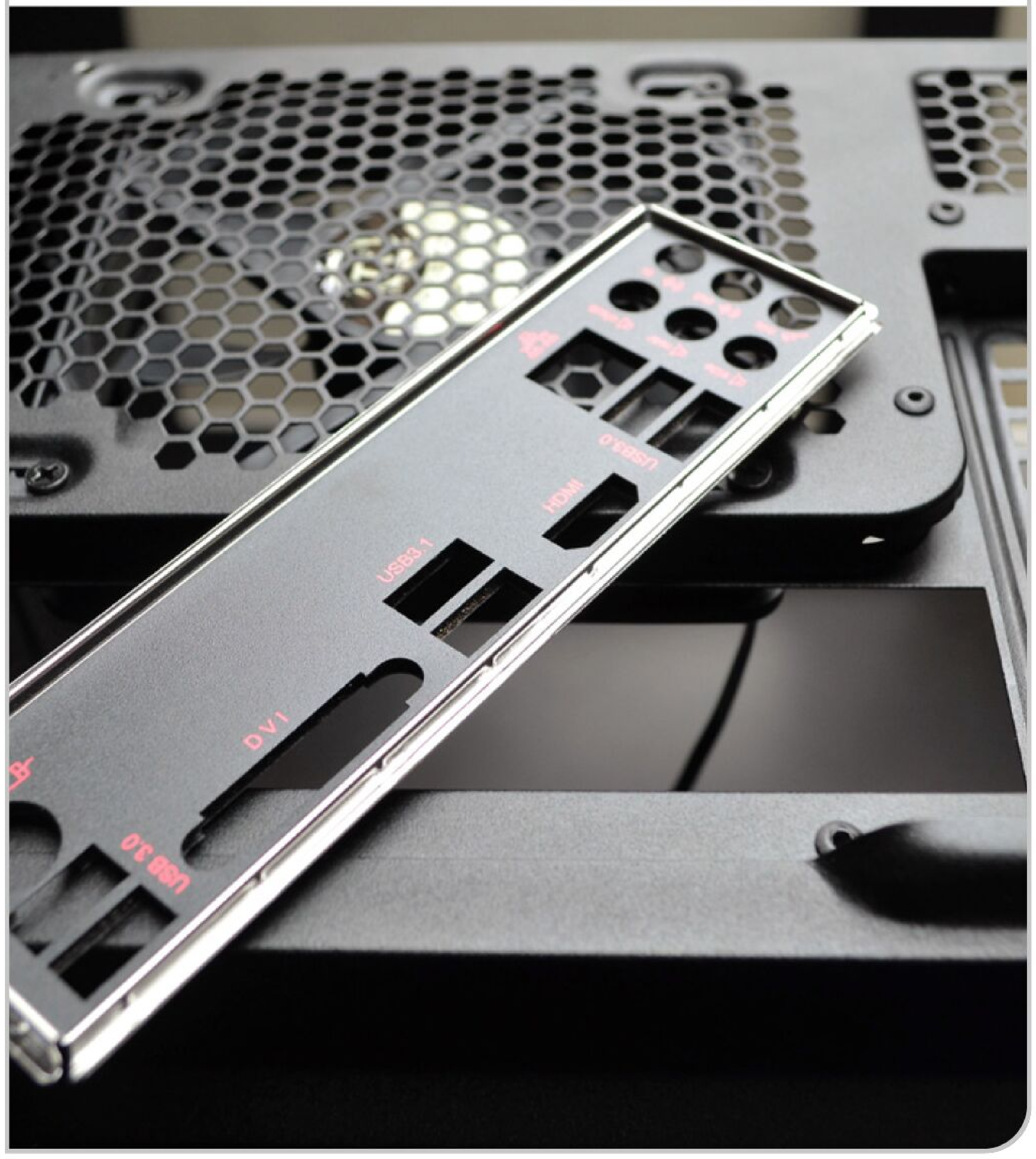
Fitting the Motherboard into the Case

If you have been following the steps of the build so far, you should now be in a position to fit the motherboard, along with the fitted CPU, cooler and RAM, into your prepared case. This not only involves screwing the board into place but also correctly connecting all the case controls like the power switch, HDD LED, front USB ports etc.. Your motherboard will also have been supplied with a back plate.

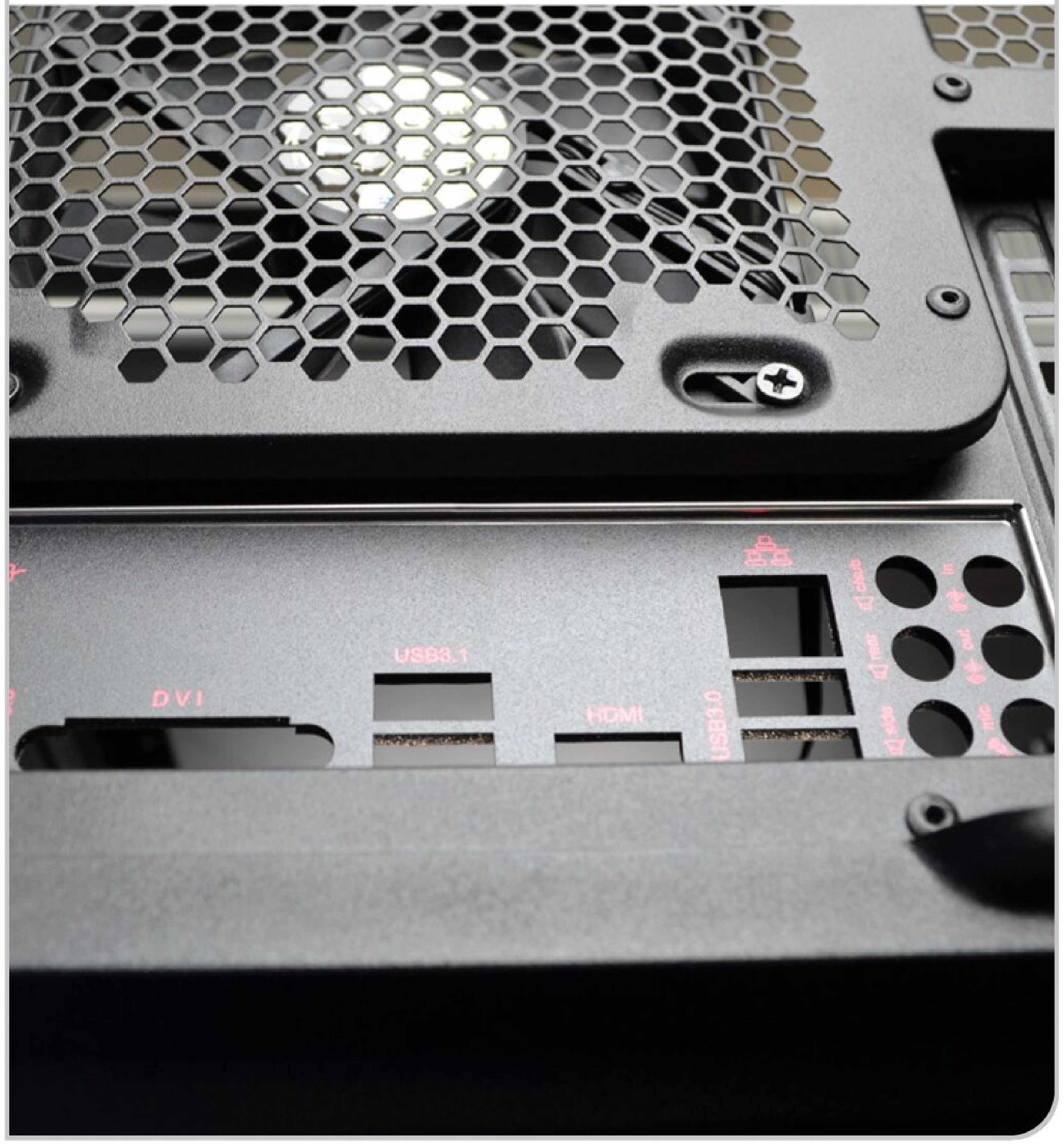
Installing the Board

This is the part of the build where your PC starts to look like a PC and not just a pile of components. Always handle the motherboard by holding the edges, not the contacts.

STEP 1 Take the back plate, which is punched with holes that match the external inputs on the motherboard back panel and press it into the rectangular hole in the back of the case. The coloured or labelled side faces out, with the padded or tabbed side facing in. The padding or tabs will help to ensure a secure fit against the back panel.

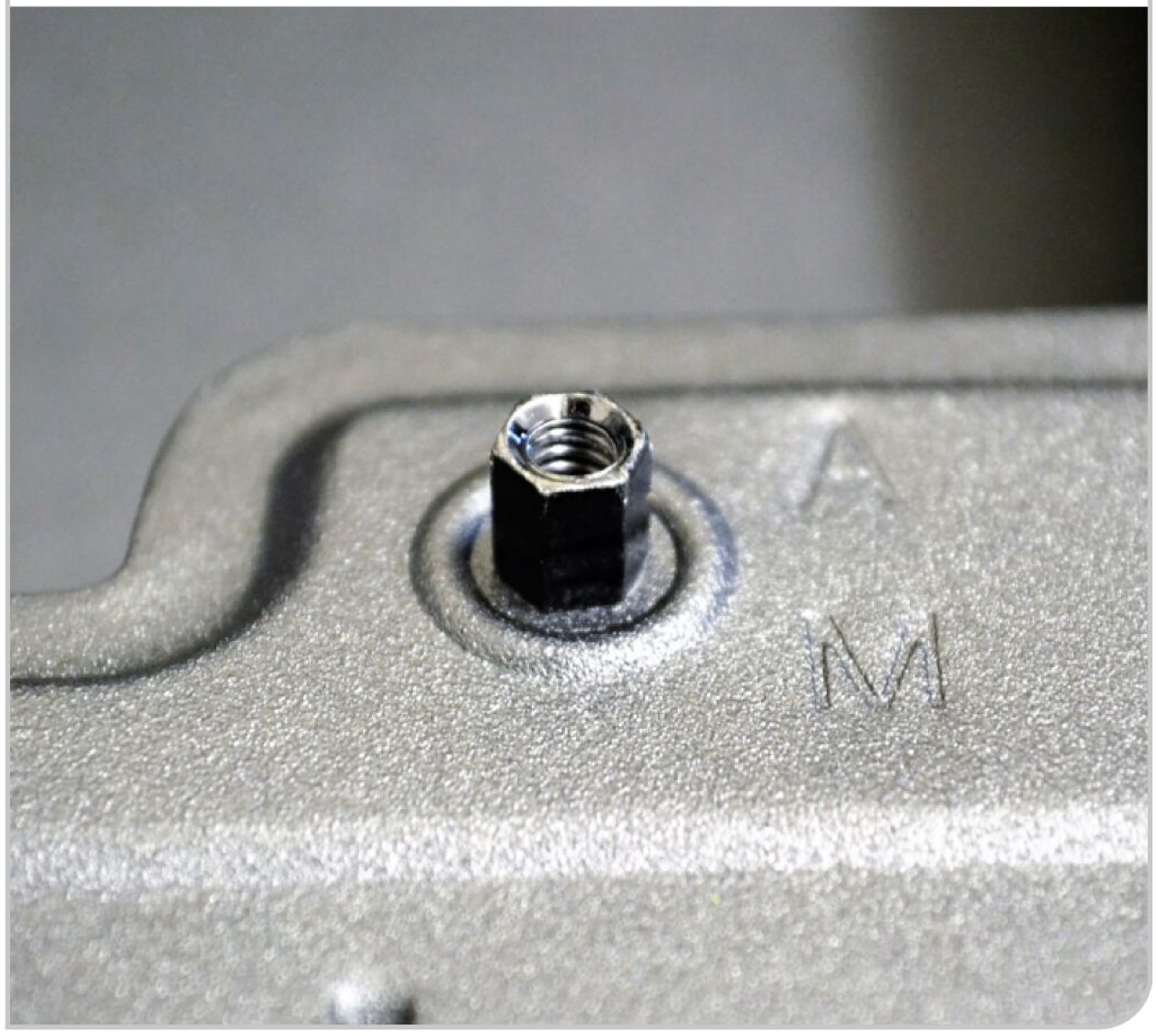


STEP 2 You obviously have to ensure that the plate is inserted the right way up, usually with the mouse and keyboard connections nearest the top of the case, and the on-board audio ports towards the bottom. Check on your specific motherboard just in case this is different. The back plate will have small protrusions or clips around the edge to help it attach to the rim of the hole.

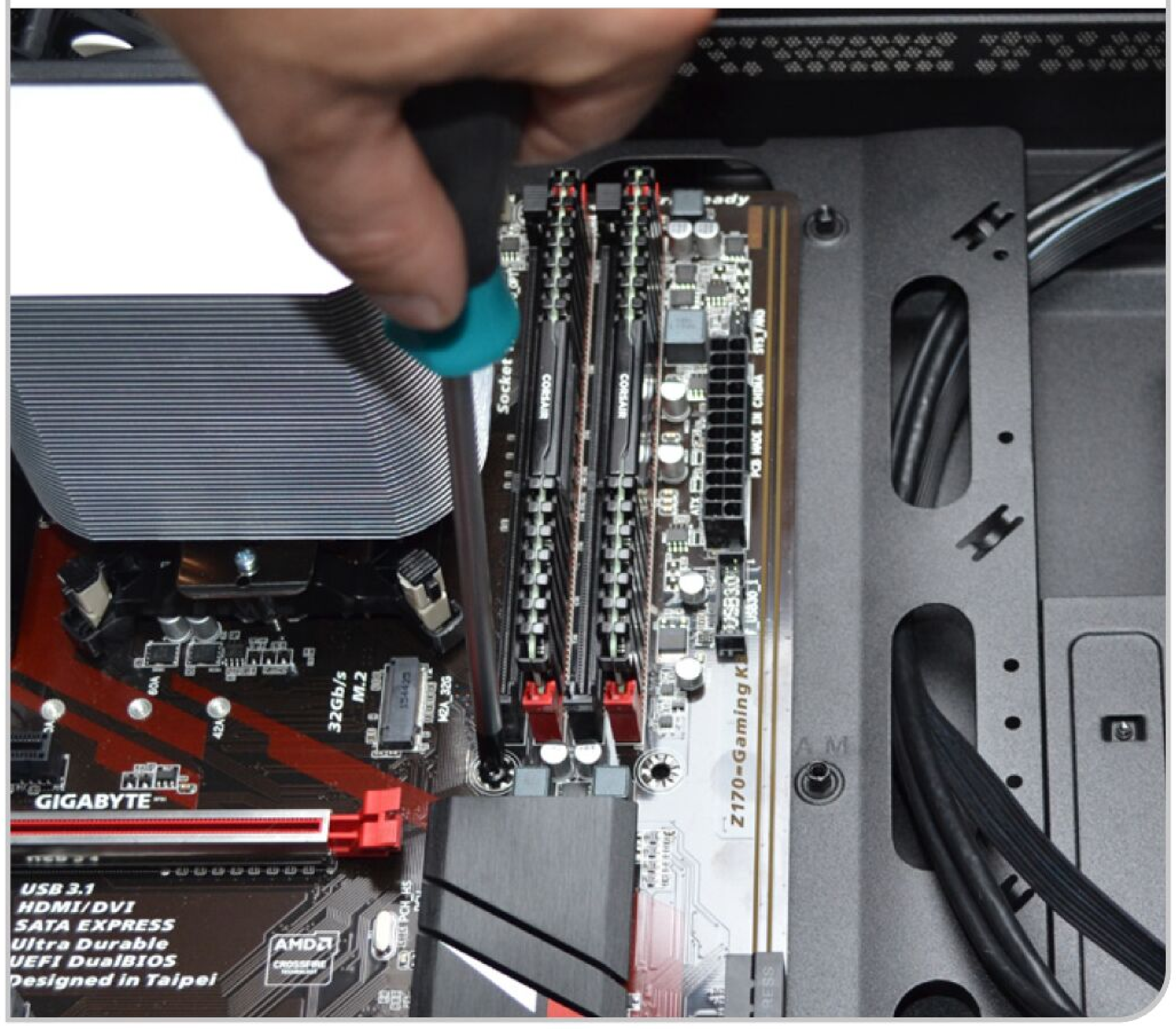


STEP 3 Lay the case down flat if it isn't already and lift the motherboard carefully in. Whenever you are going to touch the motherboard, especially the exposed connections on the back, make sure you are wearing an anti-static wristband and clip or that you discharge any built up static electricity in your body by touching a large metal object, like a desk.

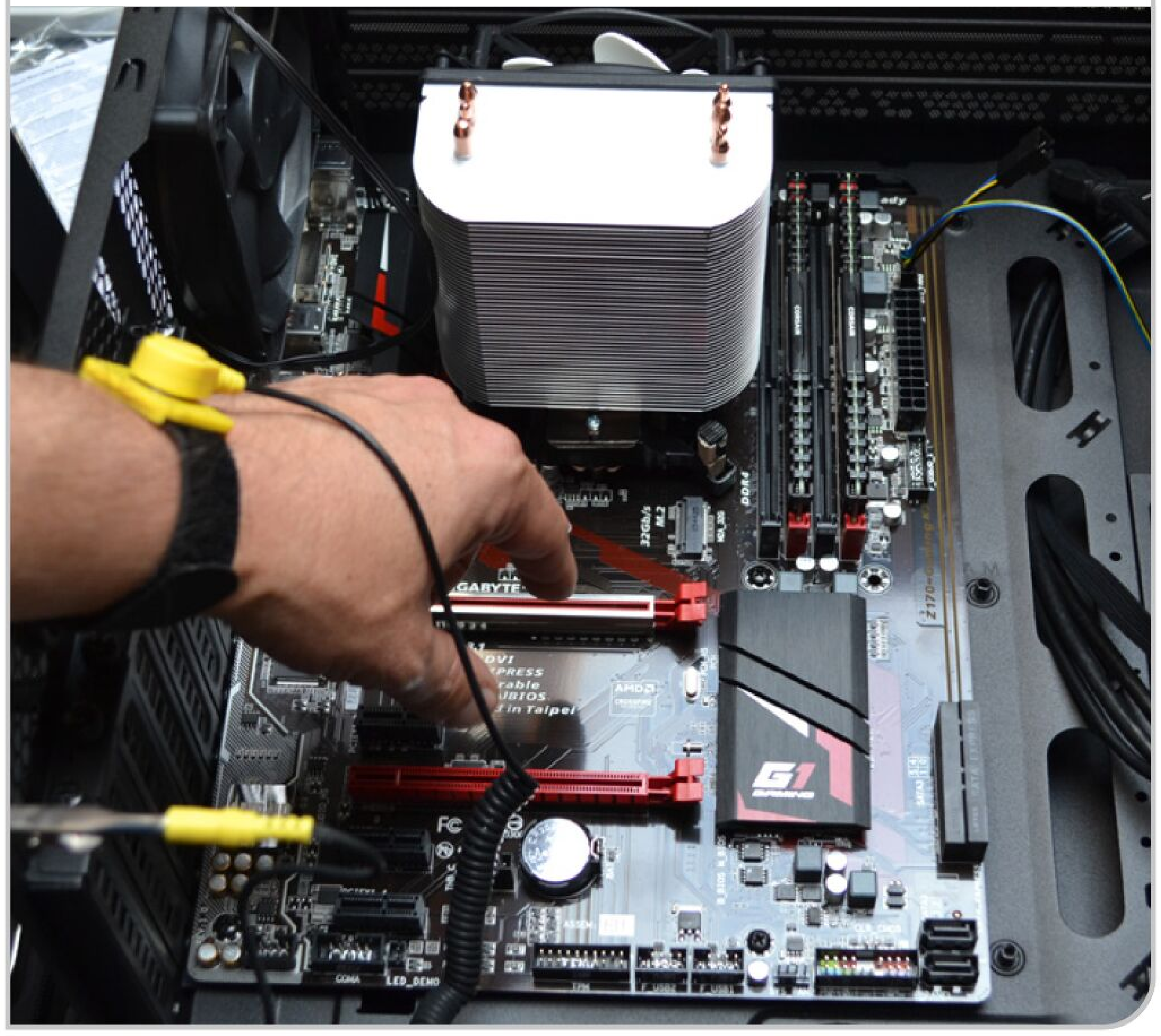
STEP 4 During the preparation of the case, you should have positioned the metal risers in the correct holes based on the form factor of your case and motherboard. Check to see if the holes on the motherboard now line up with your risers and reposition if needed. Identify the motherboard fixing screws that are supplied.



STEP 5 Carefully line up the back panel ports with the back plate holes, press the motherboard against the plate and screw one of the motherboard fixing screws into one of the holes to hold it in place. You can now insert screws into all of the other holes on the motherboard and tighten them carefully. You don't need to apply too much pressure when tightening the screws.



STEP 6 Look at the back of the case to check that the back panel ports are all correctly lined up with the back plate holes. With the motherboard now secured inside the case, you can begin to work out which of the case wiring goes where. On the next couple of pages, we will look at exactly how to connect case controls to the motherboard.

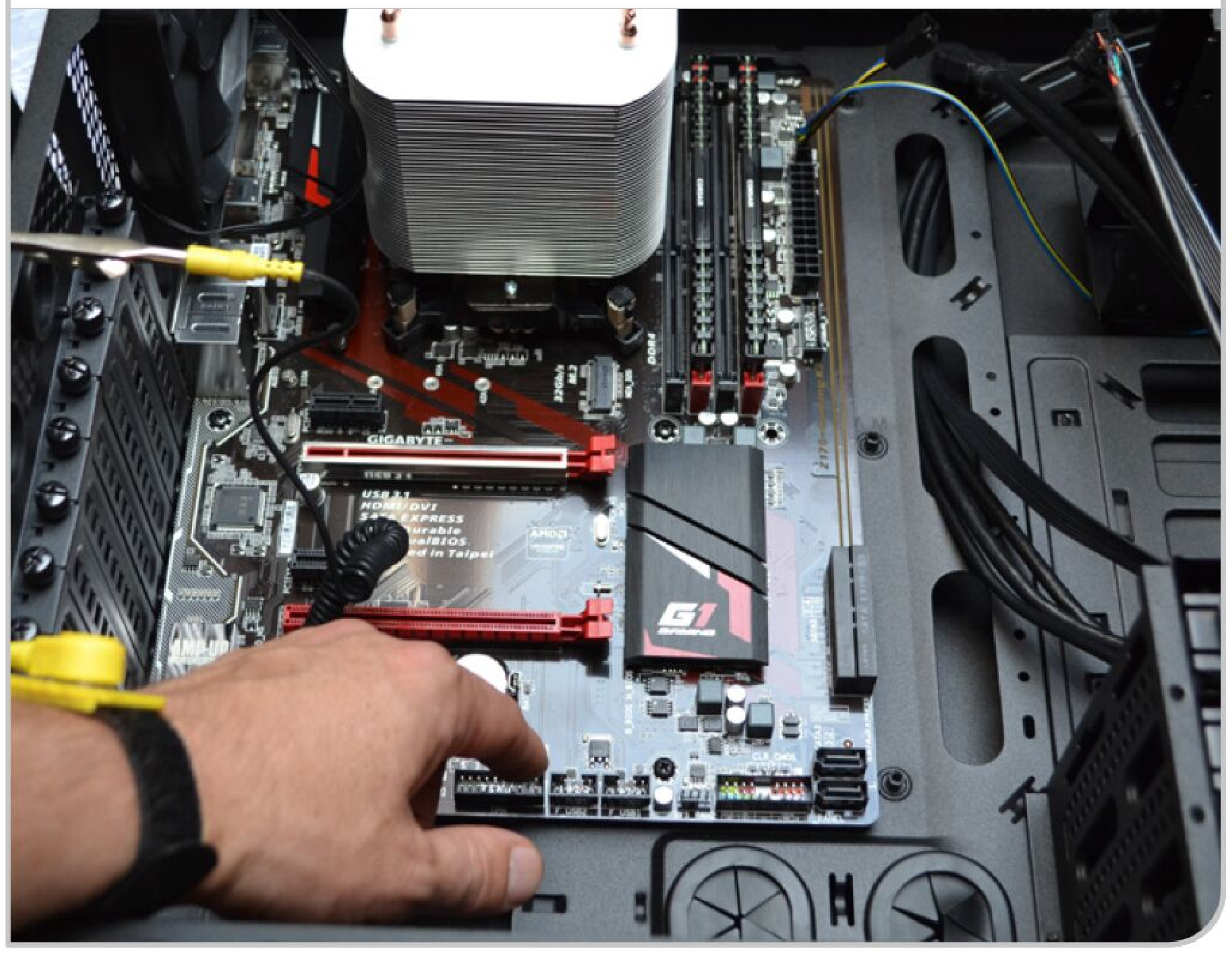


Connecting the Front Control Panel

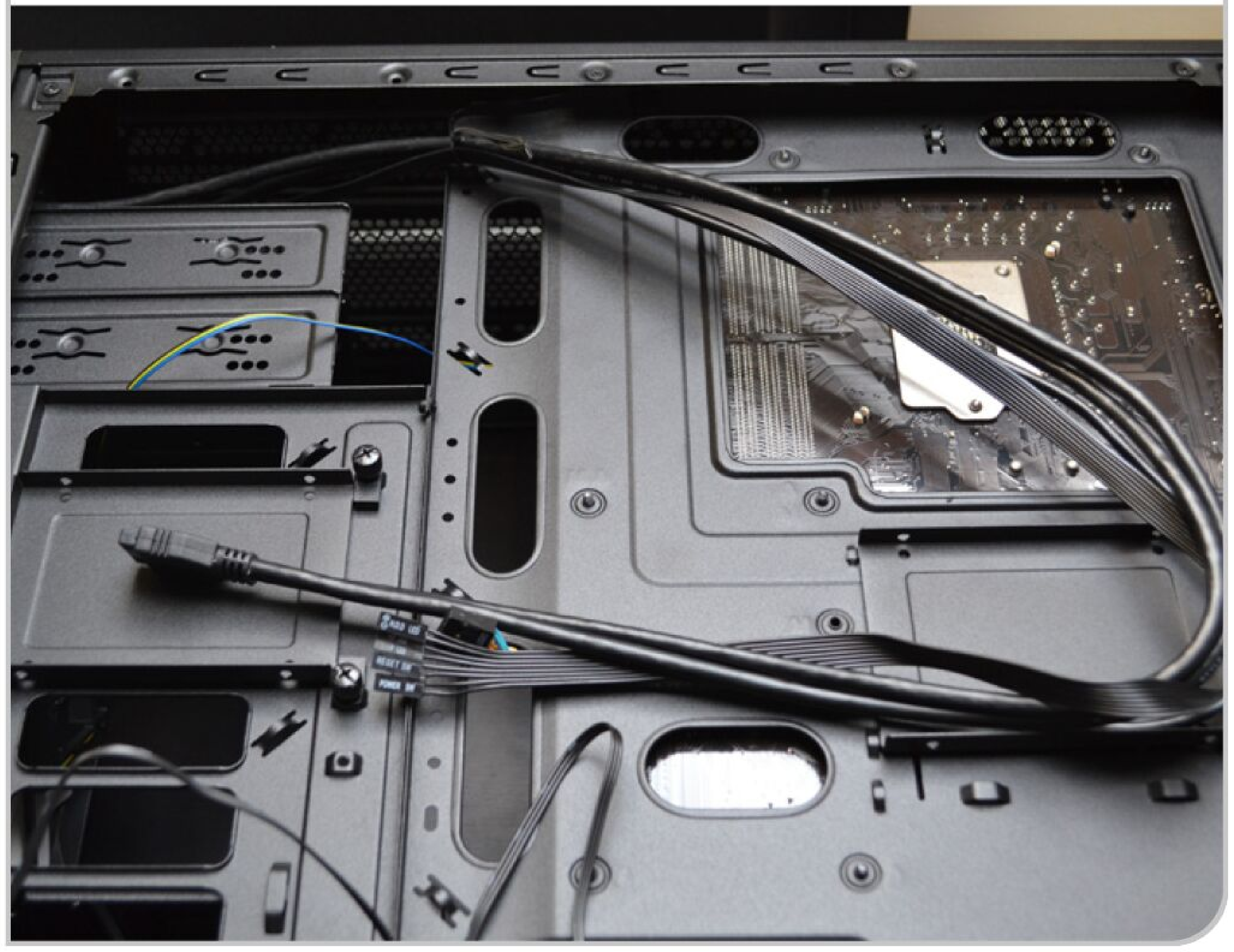
Even very basic cases will have some wiring from the front panel to the motherboard and most modern cases will have several wires, including USB headers, power controls and more.

STEP 1 Before identifying and connecting any of the control panel wiring, check to see if you can thread it through any cable management holes straight away. It might well be better to wait and see where on the motherboard it needs to reach to. The front panel is usually at the top of the case, so the wiring will normally need to run the full height of the case.

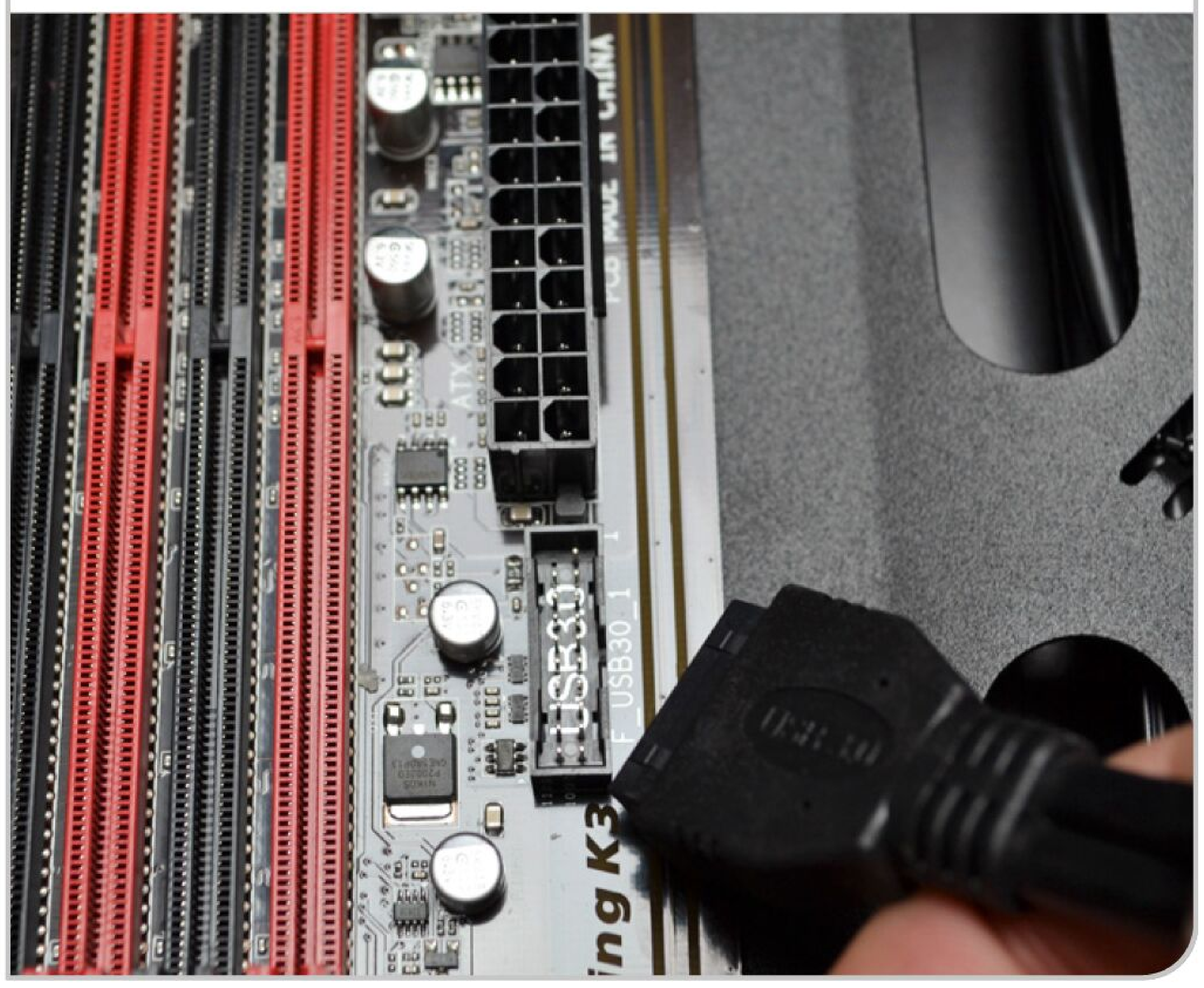
STEP 2 Apart from possibly the case fan connection, connections for front USB, audio in and out sockets and the power and reset switches are normally positioned along the bottom edge of the motherboard. Each connection socket will be labelled on the motherboard but this is sometimes hard to see. Check the motherboard manual if unsure.



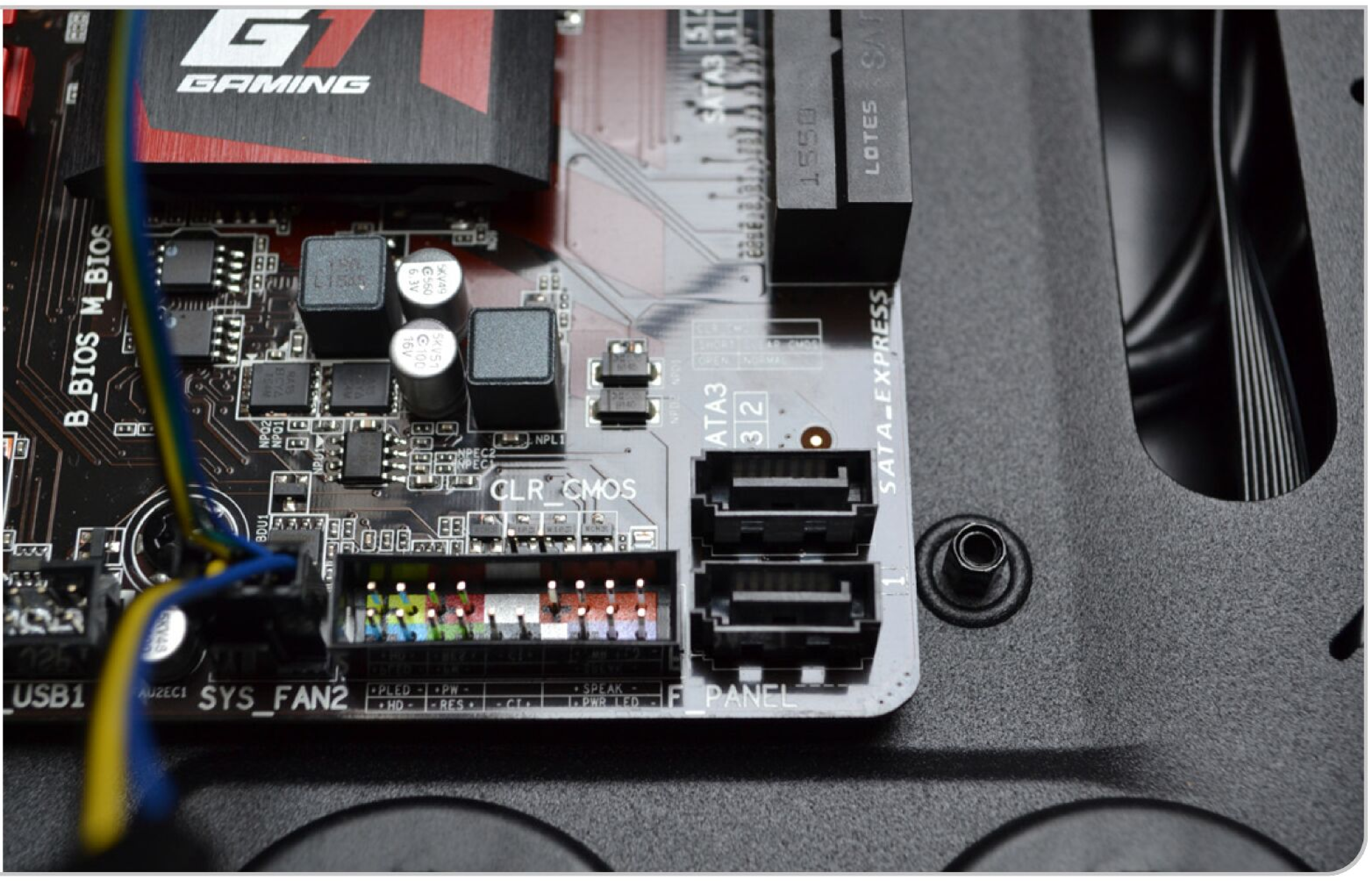
STEP 3 Once you have worked out where things need to connect, you can use the cable management holes to thread the cables around the back of the case to where they need to go. Most of the connections can only attach one way. They will either have guides on the plastic connector housing or one of the pins on the connector will be missing.



STEP 4 The front USB, audio jacks and case fan connectors are fairly simple to find and connect. The wiring for the power switch, HDD LED and the reset switch might seem a bit more confusing for the first time builder. All of these wires fit onto a single connection on the motherboard; this is just a double row of pins.



STEP 5 You can see where the power switch etc. needs to be connected by the labels printed on the motherboard. You can also check in the motherboard manual to see the correct positions. You will notice that the pins are marked as positive and negative, which will also be marked on the wiring connectors. Always connected positive to positive and negative to negative.


G1 GAMING
B_BIOS M_BIOS
CLR_CMOS
SATA3
SATA_EXPRESS
USB1
SYS_FAN2
F_PANEL

FRONT HEADER BOARD LABELS

The way the front header panel connections are labelled varies between motherboard manufacturers. It is important that you are confident about how your front header panel is connected, as incorrectly connected wires will lead to first boot problems. Listed below are the possible shorthand names for these which will be written on the connectors themselves.

Power Switch

PWR-SW, PW SW, PW

Power LED

PWR-LED, P-LED, MSG

Reset Switch

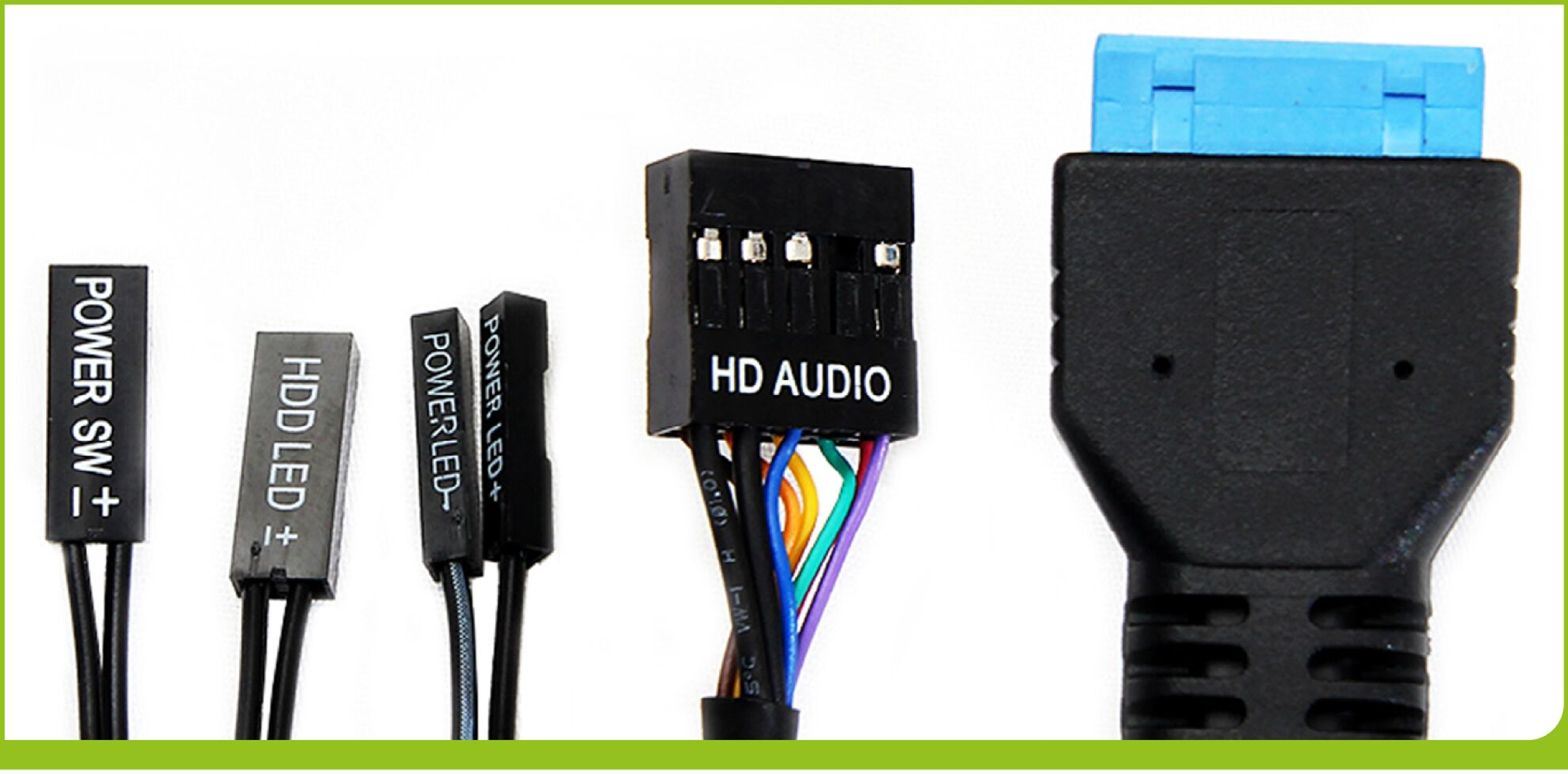
RES-SW, R-SW, RES

Hard Disk Drive LED

HDD-LED, HD

Speaker

SPK, SPKR, SPEAK


POWER SW − +
HDD LED − +
POWER LED−
POWER LED+
HD AUDIO

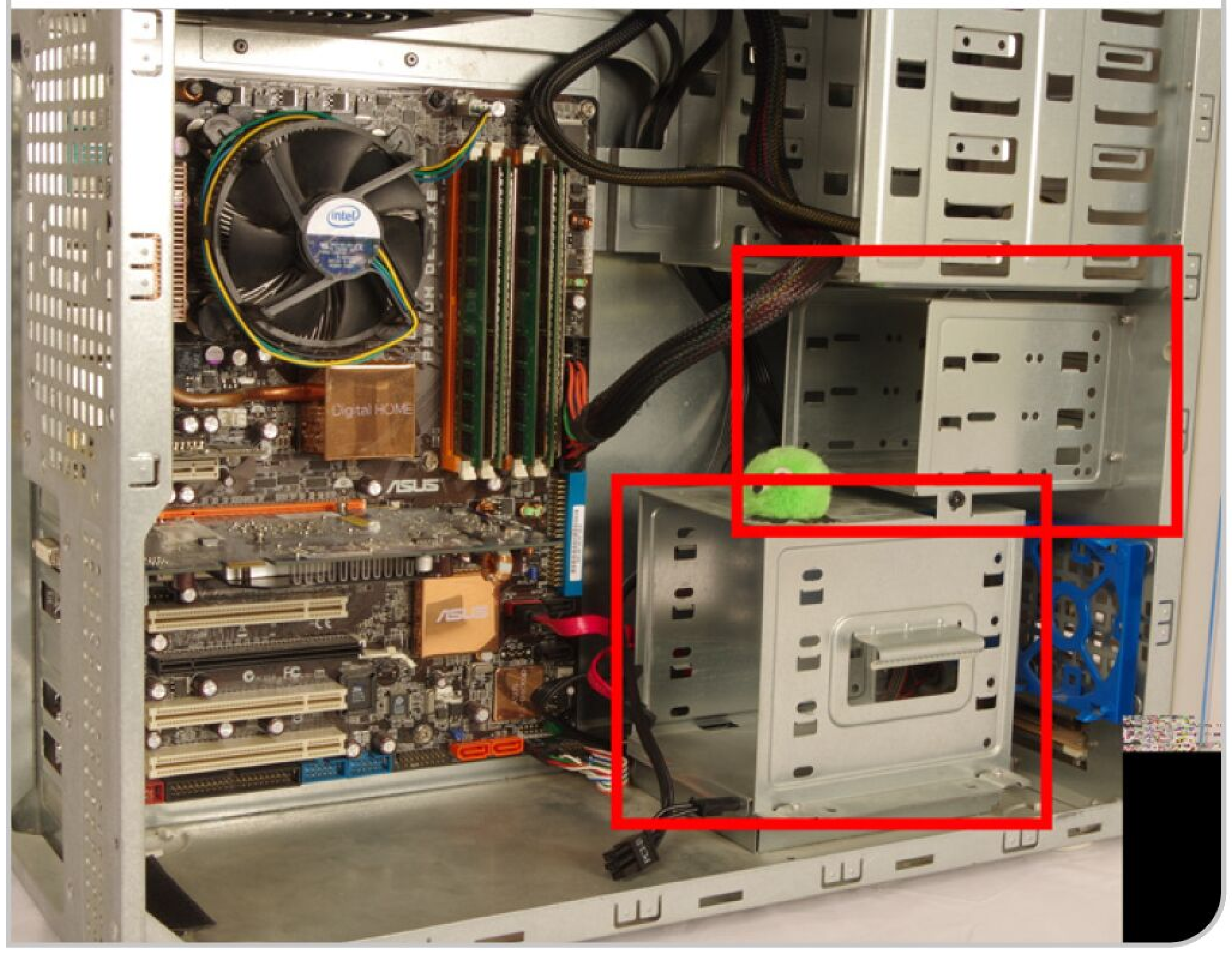
Fitting the Hard Drive (HDD)

Fitting the hard drive into most modern cases is about more than just tightening a couple of screws in the mounting bracket or sliding out a tray in the toolless drive cradle. A traditional Hard Disk Drive, as opposed to an SSD (see below), will be one of the hardest working components of your computer and has the potential to generate quite a lot of heat. Positioning it where it can be cooled efficiently will help to prolong its life.

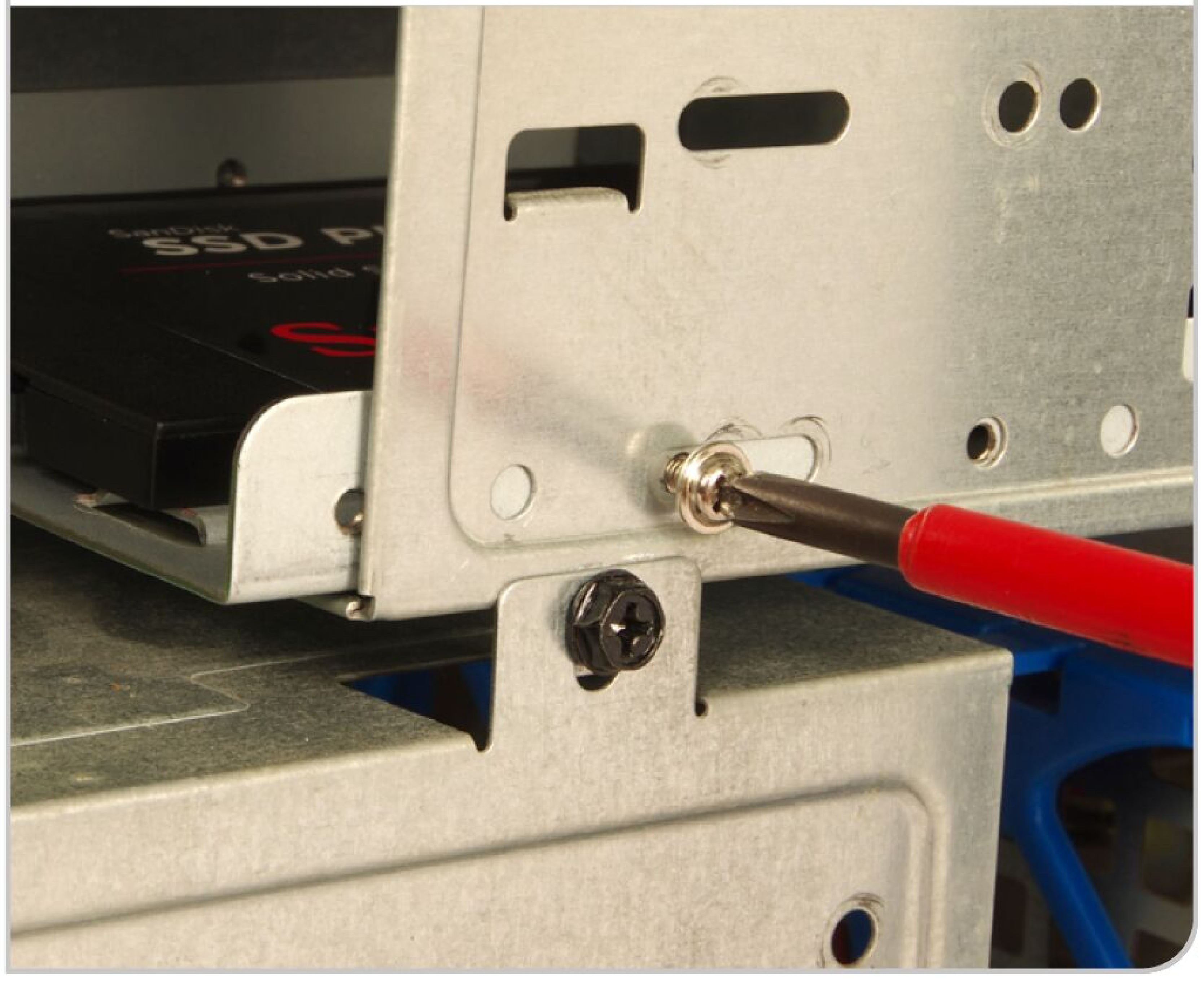
Bracket Mounting the HDD

Many modern cases will now provide a toolless drive cradle. However, before we look at the hard drive cradle in more detail, lets take a look at how to mount one in an older case.

STEP 1 HDD mounting brackets are almost always at the front of the case, just behind the front panel and usually behind a front case fan. The mounting bracket will consist of a pair of rails or tracks for the HDD to sit on, which will position it perfectly with screw holes in the side of the bracket. These holes are offset, so the HDD can only fit one way up.



STEP 2 Slide your hard drive onto the rails and line it up with the holes. It needs to have the power and SATA connectors facing out into the case. Use the screws supplied with your case to fix it in place on the open side of the case. You will also need to remove the other case panel, if not already removed and fix it from that side.



FITTING AN SSD |

Most cases now include brackets or cradles for fitting Solid State Drives (SSDs) as well as standard HDDs. Many SSDs also have a conversion bracket included, allowing them to be fitted in a normal HDD 3.5in cradle. The SSD brackets on our case are hidden in a cable management area.

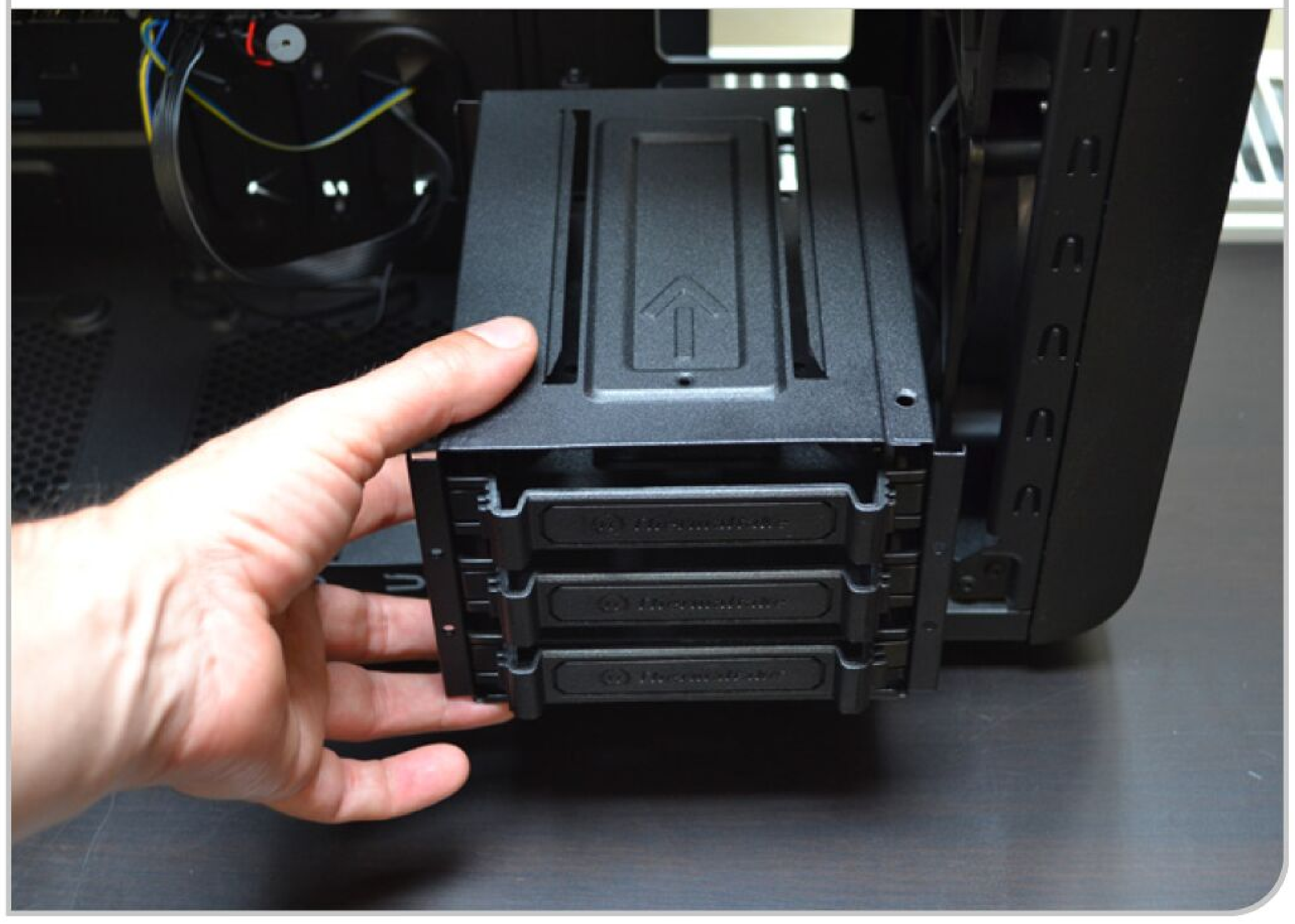
We simply need to slide the SSD in, fix it in place with four screws and then position the bracket and run the cables. If you are using an SSD in your build, it should be plugged in to a SATA3 socket, as this will make full use of the faster transfer speeds.

SanDisk
SSD PLUS
Solid State Drive
SanDisk

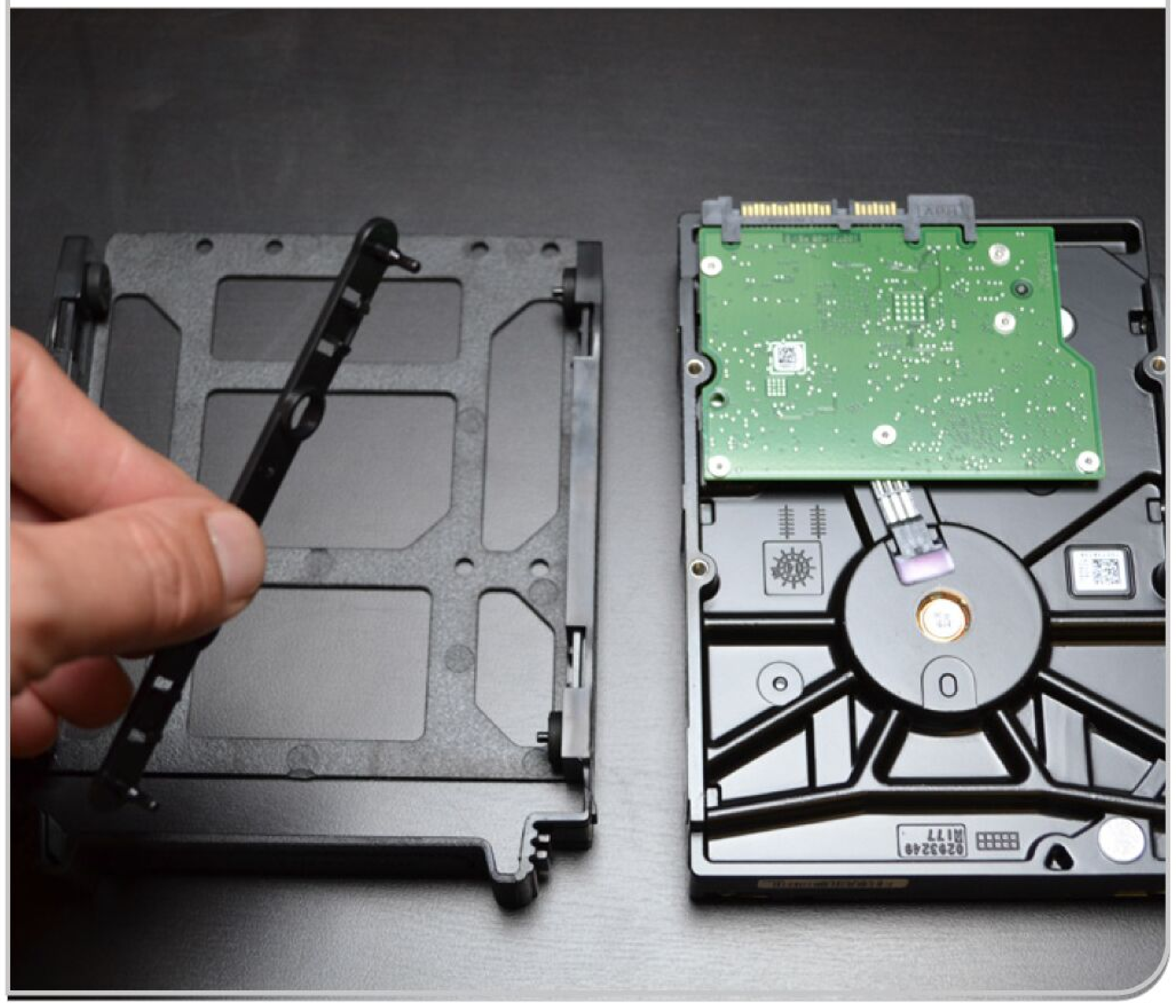
Cradle Mounting the HDD

Toolless or screw-less hard drive mounting cradles are increasingly the norm for modern cases. This is particularly true of big brand cases: Thermaltake, Antec, Cooler Master, etc..

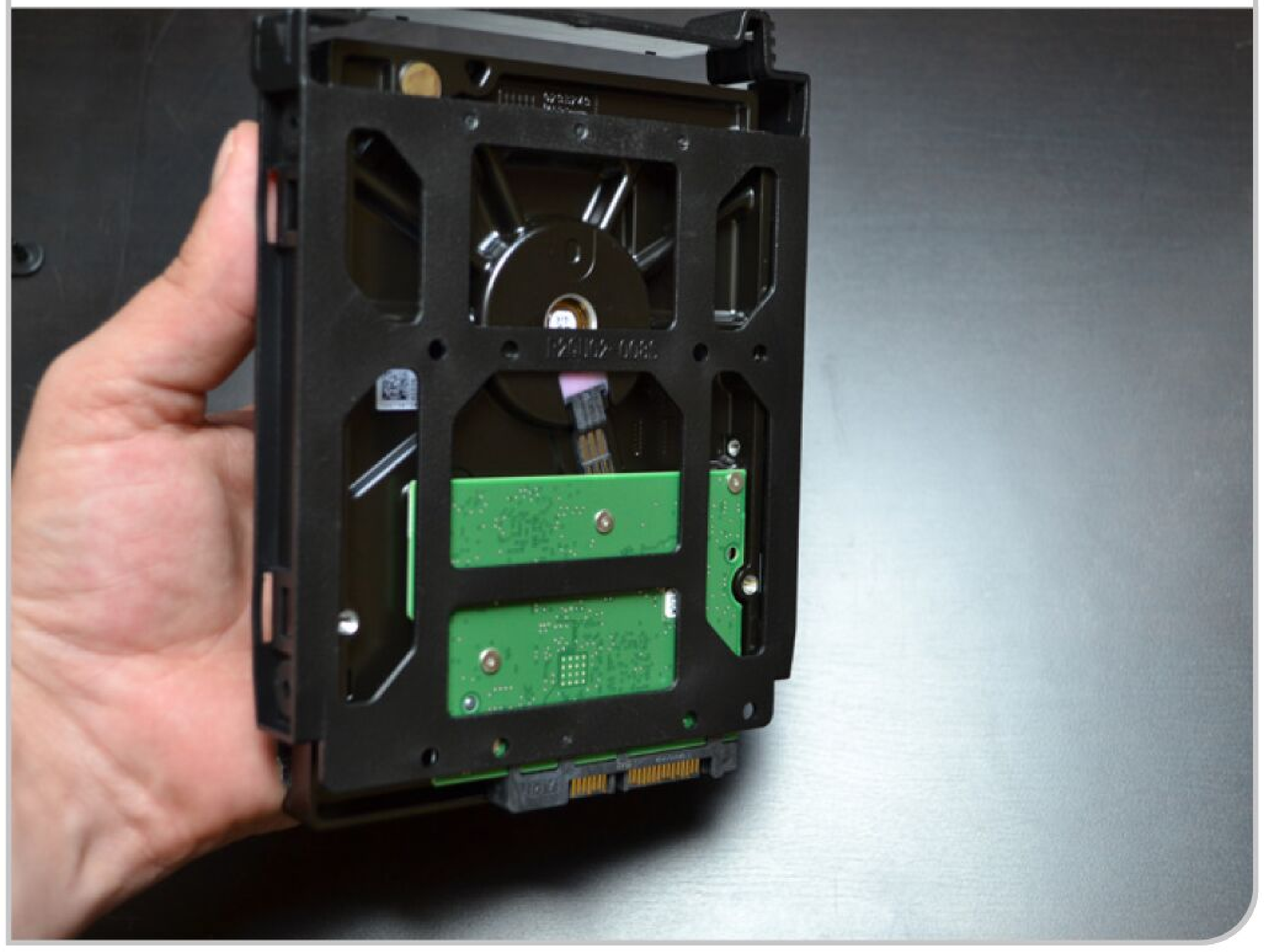
STEP 1 If your case features a hard drive cradle, like ours, the process of fitting your hard drives into place is even easier than with a standard bracket. In many cases, the cradle itself can be repositioned or even removed completely if you are using SSDs solely in your build. Ours can be moved up to a higher position but we will leave it as is, to allow for the GFX card later.



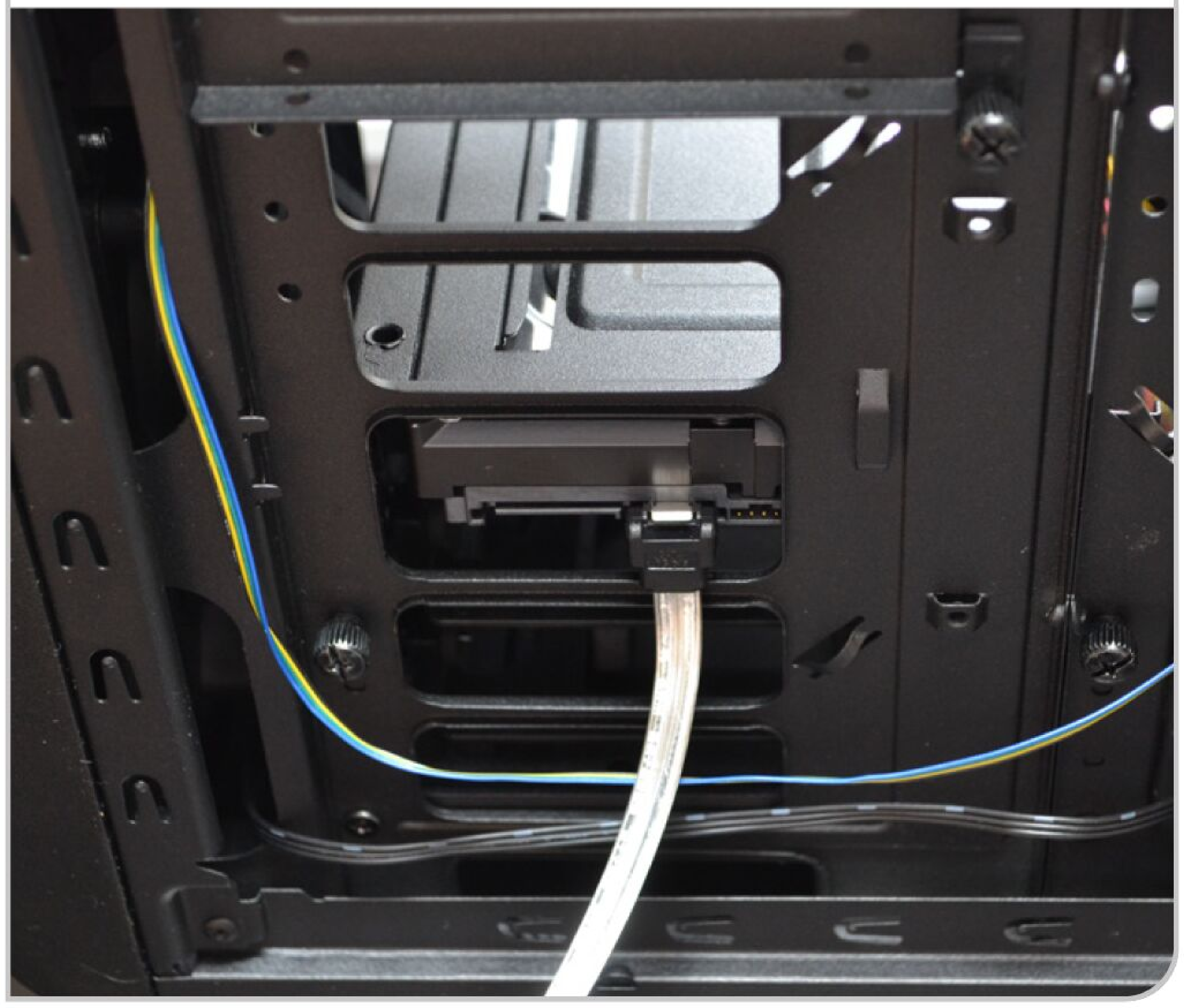
STEP 2 Pull a tray out of the cradle. Hard drive cradles are usually toolless but some may be screwed in. The method of fixing the hard drive into the tray varies between cases. Some will need to be screwed in and some will have screw-less fixings, such as the one shown here. Remove the screws or fixing and place your hard drive into the tray.



STEP 3 During the preparation of the case, you should have positioned the metal risers in the correct holes based on the form factor of your case and motherboard. Check to see if the holes on the motherboard now line up with your risers and reposition if needed. Identify the motherboard fixing screws that are supplied.



STEP 4 We will look at connecting the power supply to the hard drive later. For now you can connect the SATA cable from the small port on the back of the HDD, to one of several SATA ports on the motherboard. You may have other components that need a SATA connection but as a rule, the HDD should go into the first SATA3 port on the motherboard.



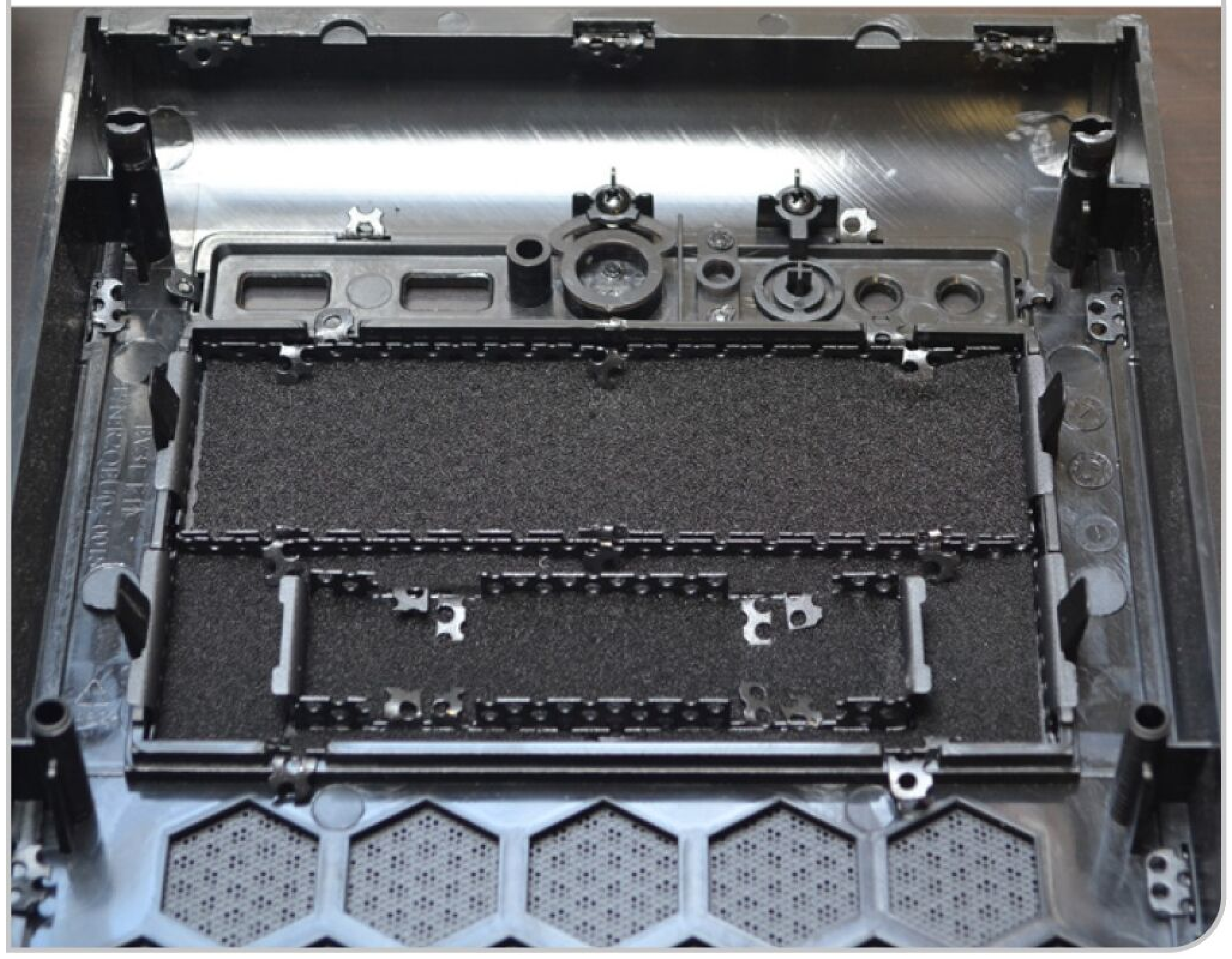
Fitting Optical Drives

Optical drives are what you need to play things like CDs, DVDs and BluRay discs. Once an essential part of any PC build, they are becoming increasingly less so as more and more media is streamed or delivered wirelessly. However, a DVD RW drive is still a useful addition, and as they are fairly cheap, there is no real reason not to include one in your first build. Almost all cases still feature an opening for at least one optical drive.

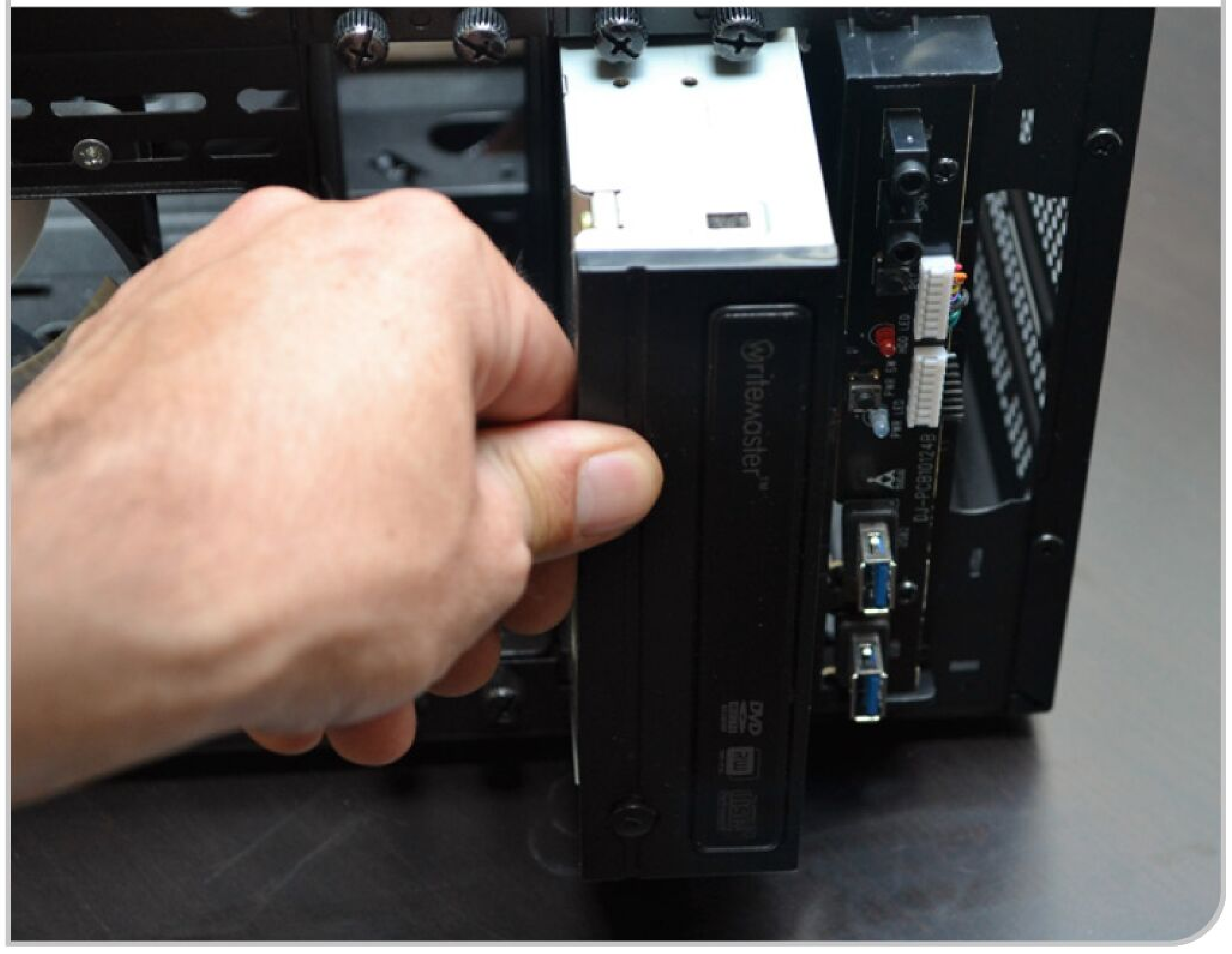
CD and DVD Drives

A standard size optical drive will normally be called a "Five and a quarter inch" drive. Most sit flush with the front of the case, but some cases hide drives behind a panel.

STEP 1 The standard way to install an optical drive is to insert it from the front of the case, rather than on the inside as with your hard disks. Sometimes you can slide the drive in directly through the front panel of the case but often the first thing you'll need to do is to remove the case's front panel completely. Normally, with a slight firm tug, the front will just pop off.



STEP 2 Slide the optical disc drive into the drive bay and push it back until the front is flush with the case. Screw-holes on the side of the drive should line up with holes in the drive bay. Secure the optical drive in place using four screws, much as you would with your hard disk. You should use four screws in total, two on each side, so you will need to remove the back panel.

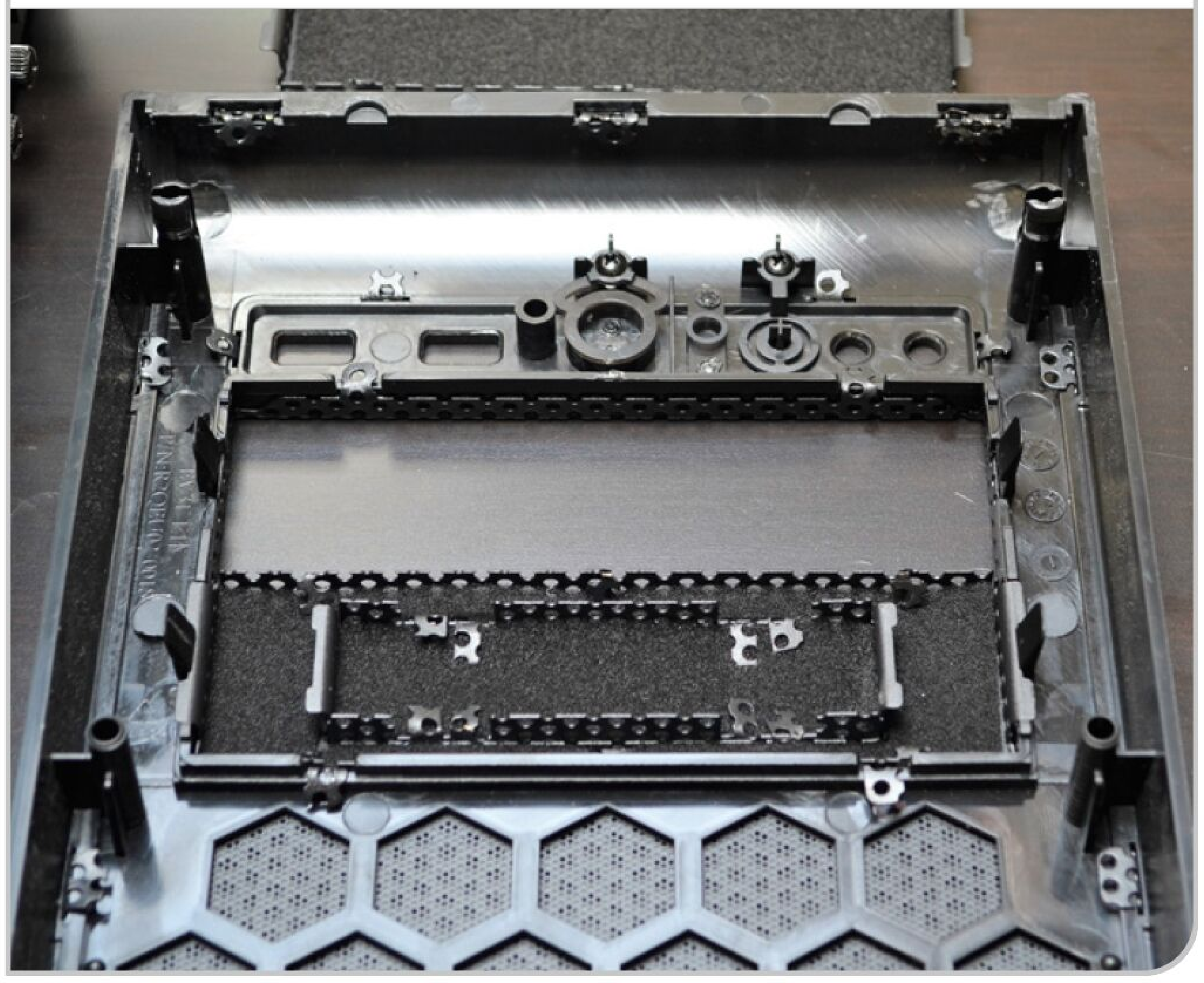


CD AND DVD BACKUPS

Some drives can only read from certain discs but modern drives, also called burners or writers can read and record. Optical discs can be used to back up relatively small amounts of data (a standard blank DVD will hold no more than 4.7 gigabytes) but backing up of entire hard drives, which as of 2016 typically contain many hundreds of gigabytes or even multiple terabytes, is less practical. Large backups are usually made now on external hard drives as their price has dropped to a more suitable level.

super multi blue
LG
Blu-ray Disc
BD-ROM / DVD Rewriter

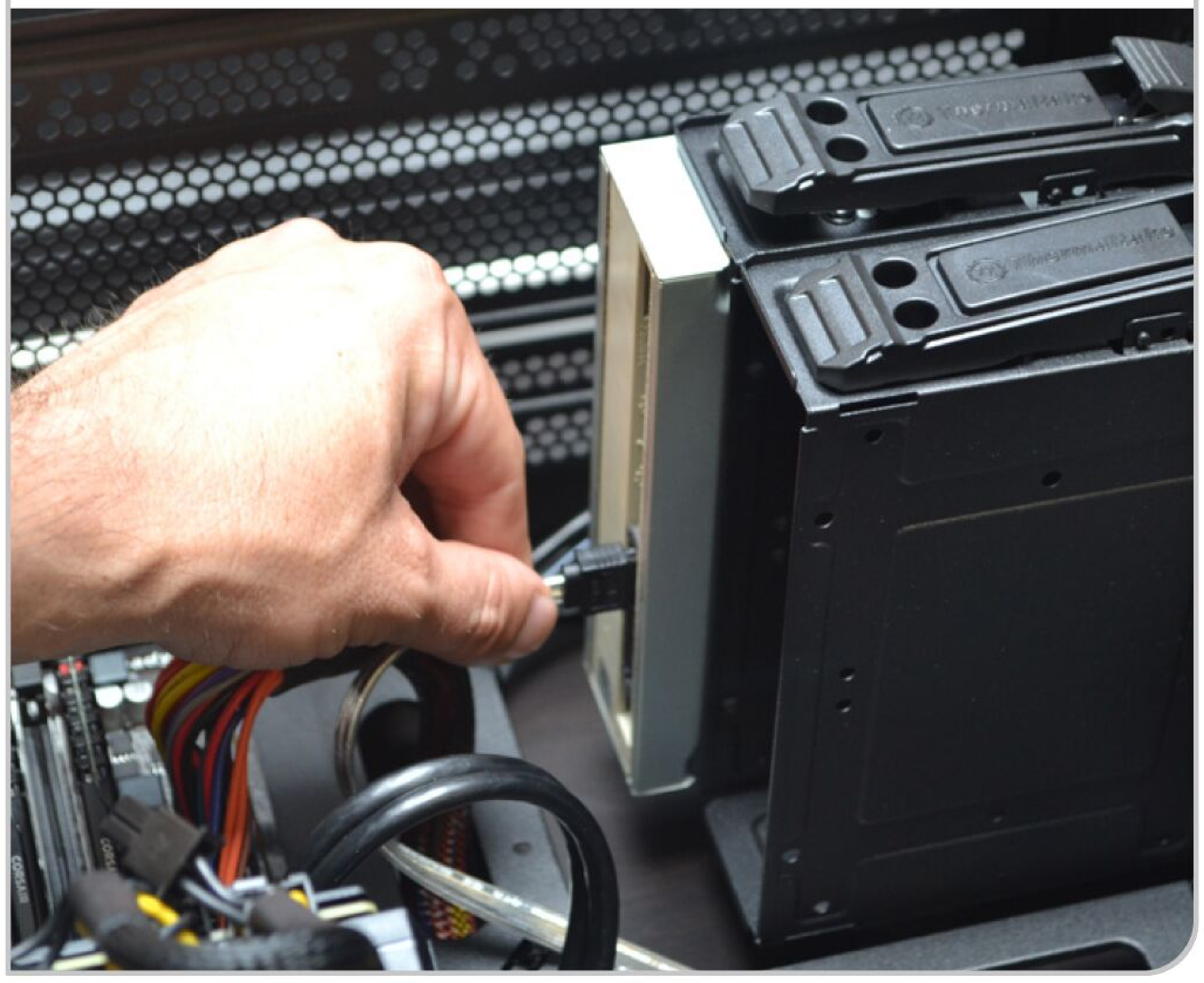
STEP 3 The hole for the optical drive in the case front may be blanked off with a solid panel, so that the front looks like it's one piece. This will need to be removed before the case front is clipped back into place. Usually, any drive bay blanks can be removed simply by releasing simple clips around the edge. In other cases, the front panel of the case may have a door, behind which the drive will be hidden.



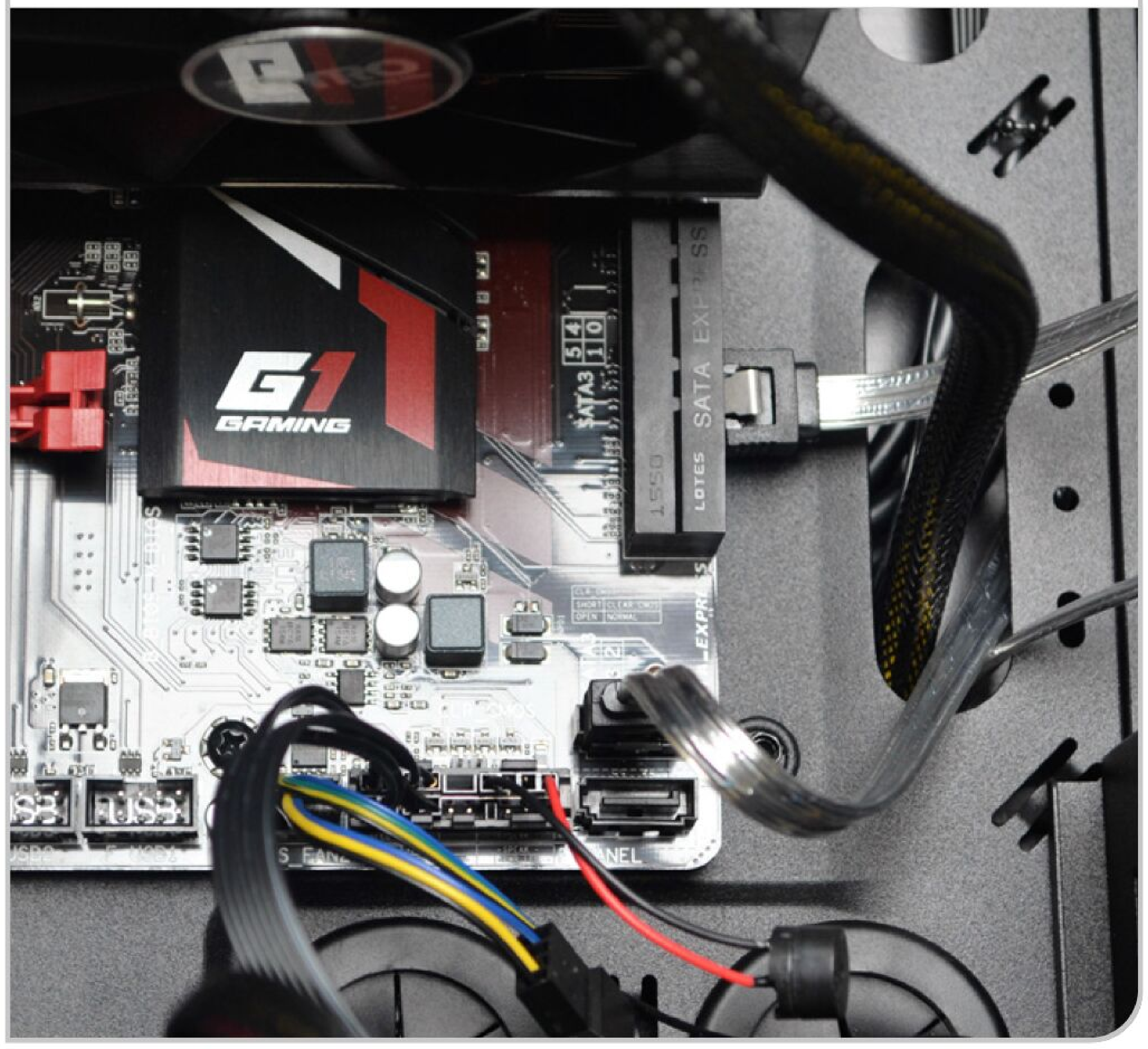
STEP 4 You can now replace the front panel of the case and adjust the position of the optical drive, if needs be, by loosening the fixing screws slightly and using the slots to slide it back or forward. If you have a second optical drive to fit and if your case features a second bay, repeat steps 1-4. There are several other components that can be fitted into a 5 ¼ in drive bay, such as fan controllers.

Thermaltake
Thermaltake

STEP 5 We will look at connecting power to the optical drive later but for now connect a SATA cable to the back of the optical drive as you did with your storage disks. If you've installed a few storage disks you might be running low on SATA cables unless your optical disk drive had one included, so make sure you have enough. Run the cable through any appropriate cable management hole.



STEP 6 Locate the SATA ports on your motherboard that you used earlier to connect your hard drive. If your motherboard has a mix of SATA2 and SATA3 ports, which is often the case, it is a good idea to use a SATA2 port for your optical drive. Very few optical drives benefit from the faster speeds, so you can save your SATA3 ports for future component additions.



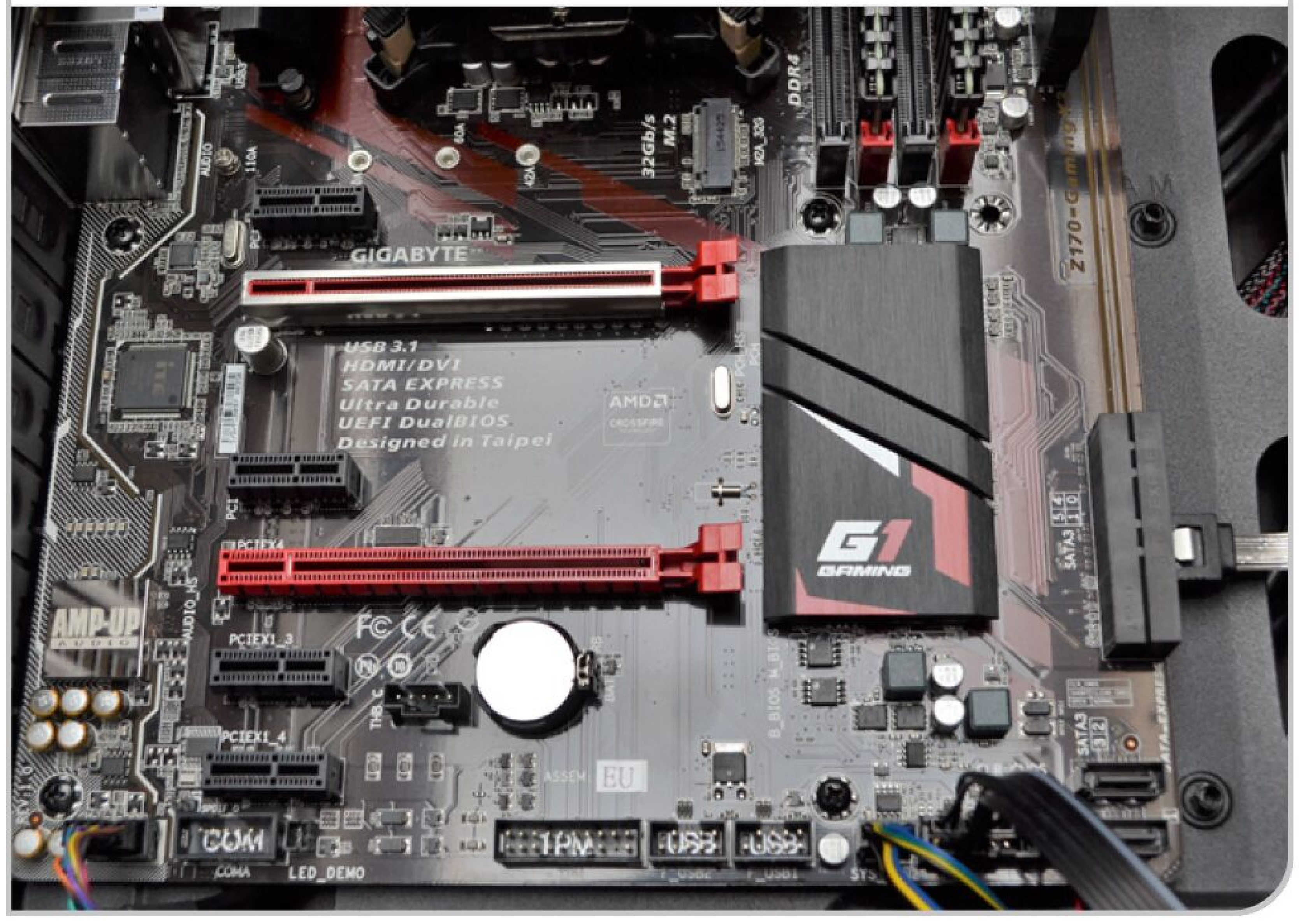
Installing the Graphics Card

For some of you a powerful graphics card (GFX), or Graphics Processing Unit (GPU) to give it its correct name, will be an essential for your build. For others, being able to play the latest games on ultra-high settings won't be important at all. Unless you have purchased an AMD APU, all new builds will need a graphics card of some sort installed. The GPU will probably be one of the most expensive components you buy, so it would be silly to take chances when installing it.

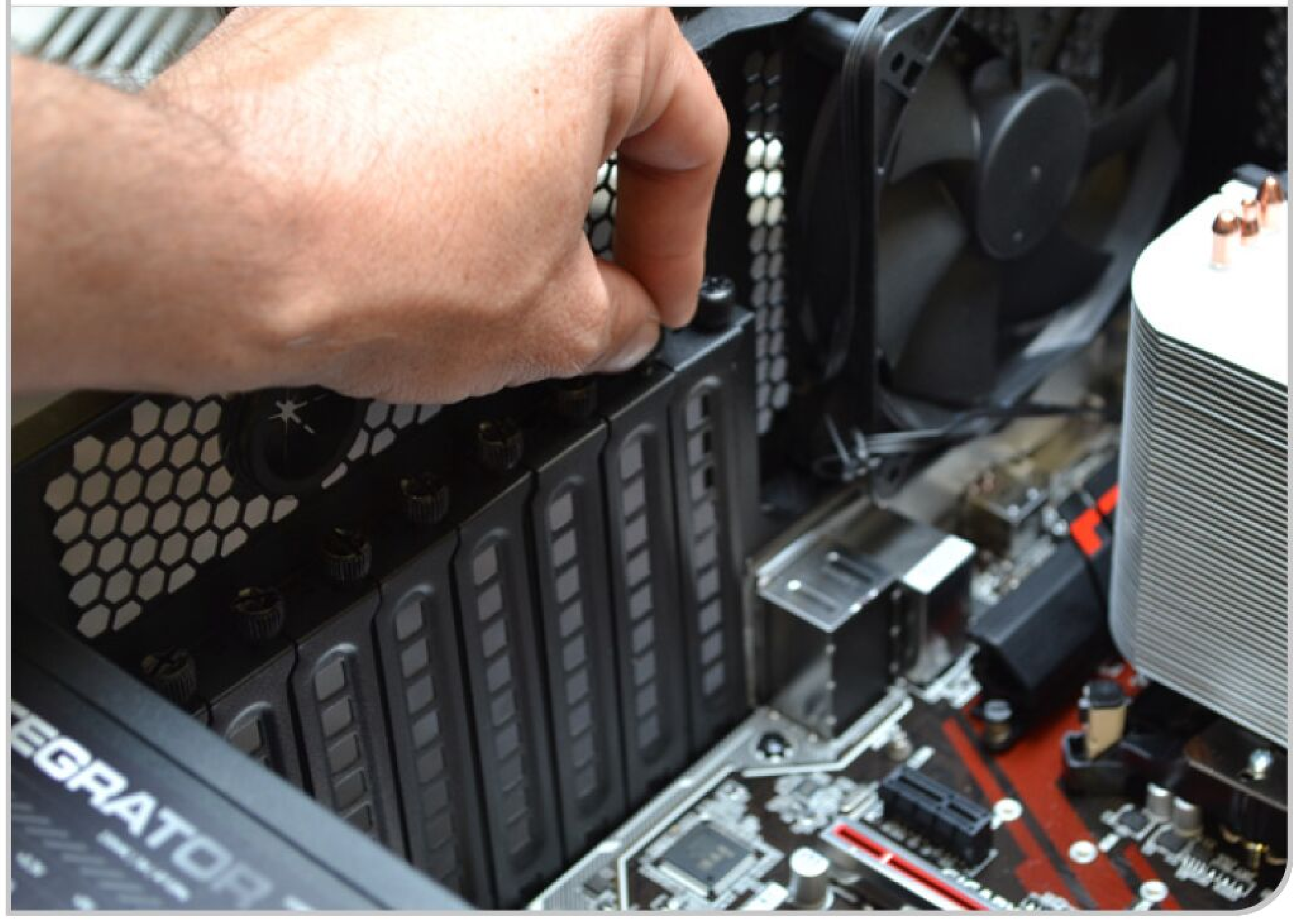
Fitting a PCIe Card

Almost all graphics cards you buy these days, even cheap ones, will fit in the PCIe socket on your motherboard, so this is the type we will look at here.

STEP 1 The first thing to do is make sure that the PCIe socket on your motherboard is clear of cables and that the graphics card will fit in the case when it is plugged in. Some cards are very long and if you are using a mATX case, it might be a tight squeeze where your hard drive cradle projects from the front. If possible move the HDD cradle to give the GFX card more room to breathe.

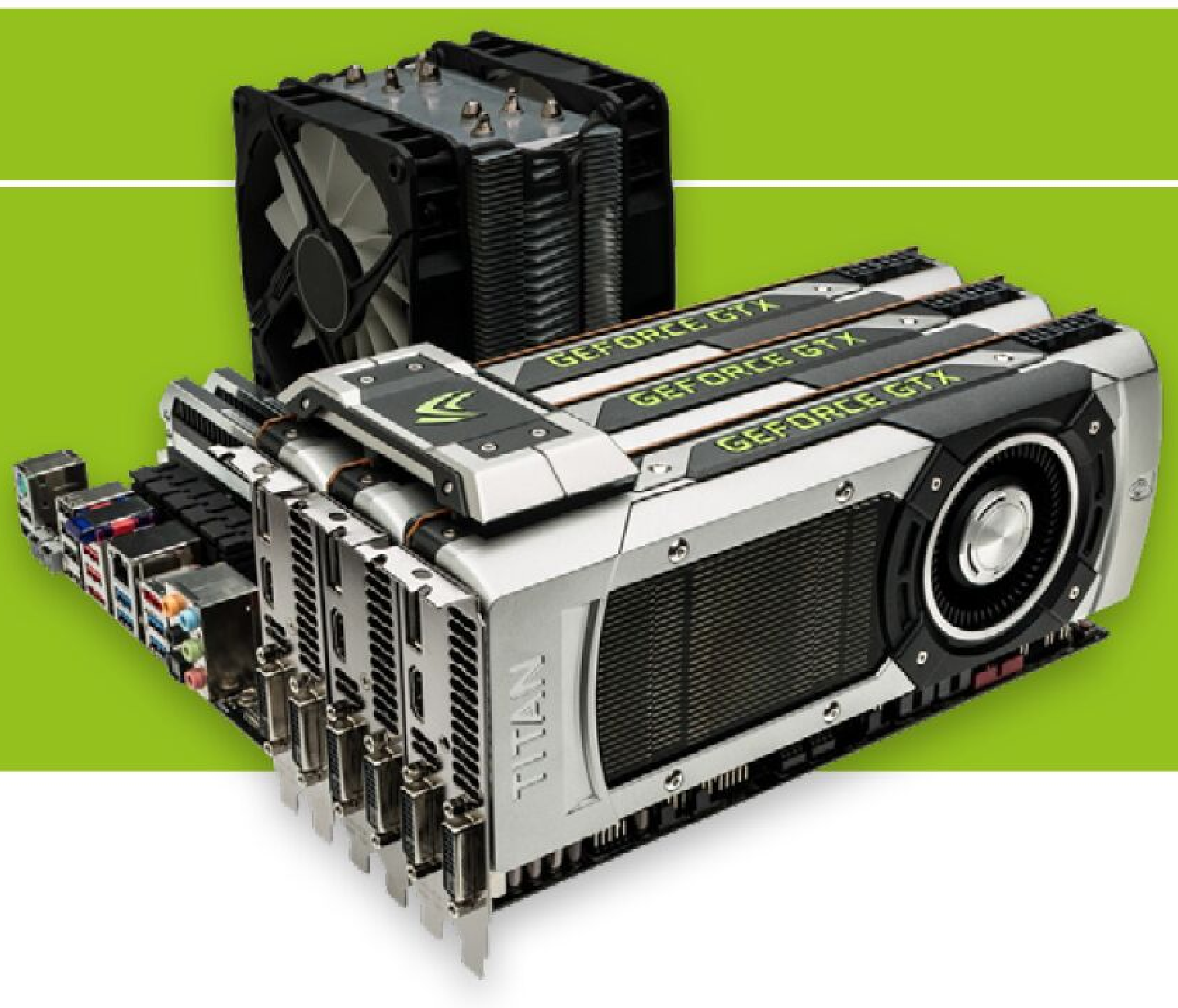


STEP 2 Depending on the GFX card you are installing, you will need to remove either one or two of the blanking plates that cover the expansion slots at the back of the case. These can usually be removed by unscrewing from the inside, although some cheaper cases may require you to remove the plates permanently by snapping them off the small metal tabs holding them.

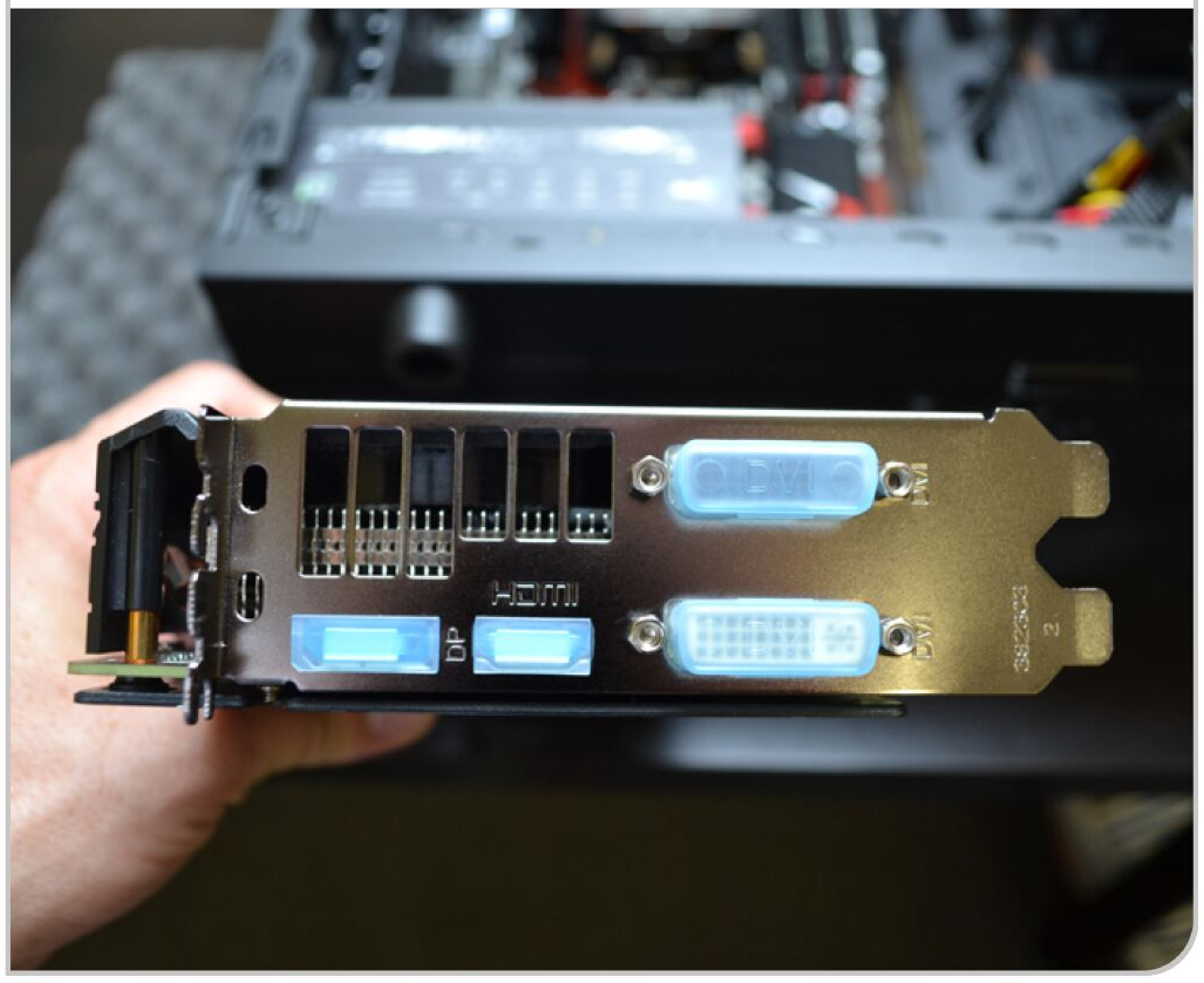


MULTI-CARD SCALING |

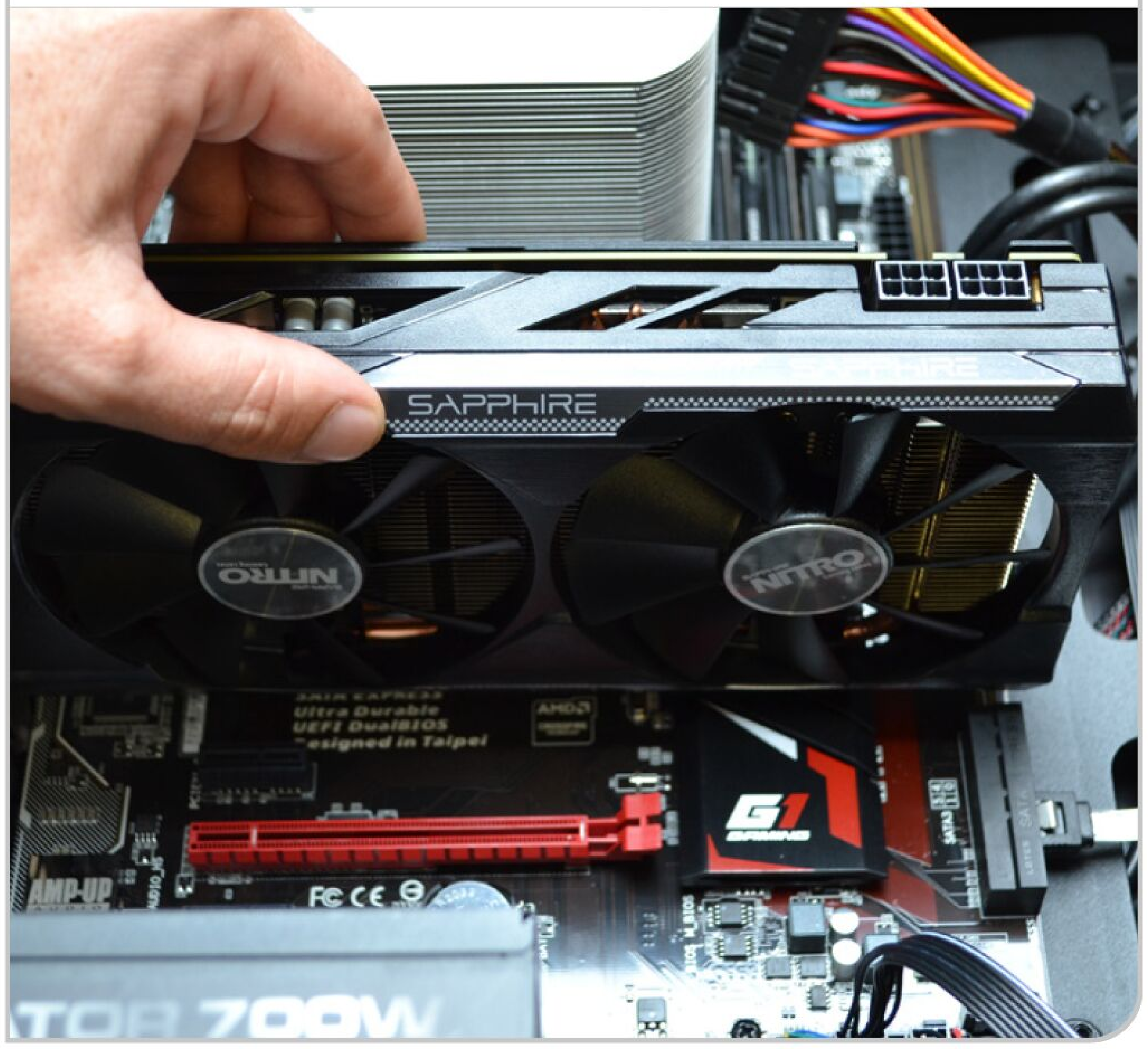
Certain graphics cards can be linked together to allow scaling of the graphics processing across multiple cards. This is done using either the PCIe bus on the motherboard or more commonly, a separate data bridge. Generally, the cards must be of the same model to be linked and most low power cards are not able to be linked in this way. AMD and Nvidia both have proprietary methods of scaling: CrossFireX for AMD and SLI for Nvidia.



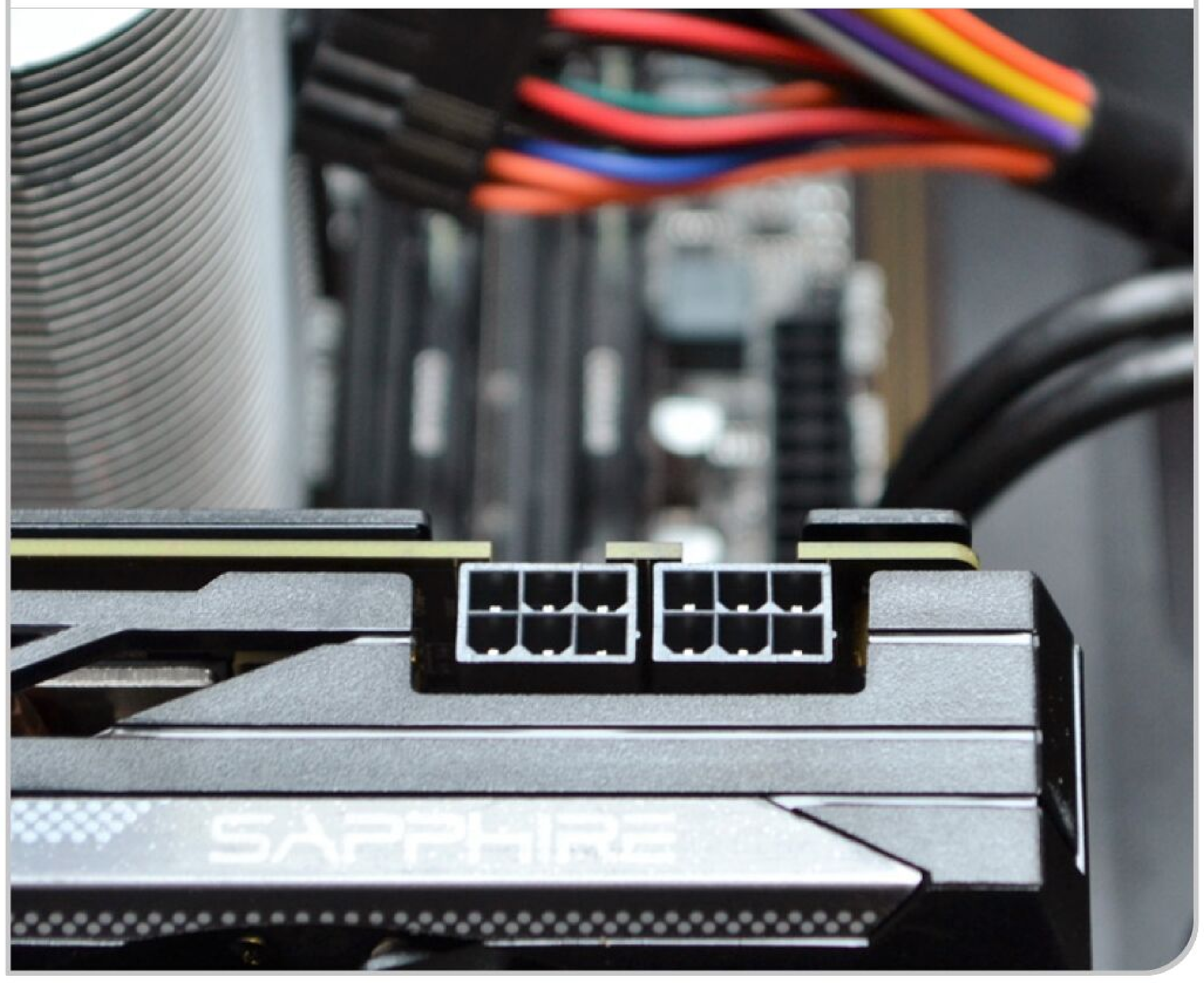
STEP 3 Make sure there is no cover on the card connector and then carefully lower it into the PCIe socket. These sockets always have a catch on them, which will help hold the card securely in place. You may need to slide or tilt this catch back to get the connector into the socket. The connector on the card will have a slot in it that will help you line it up with the socket correctly.



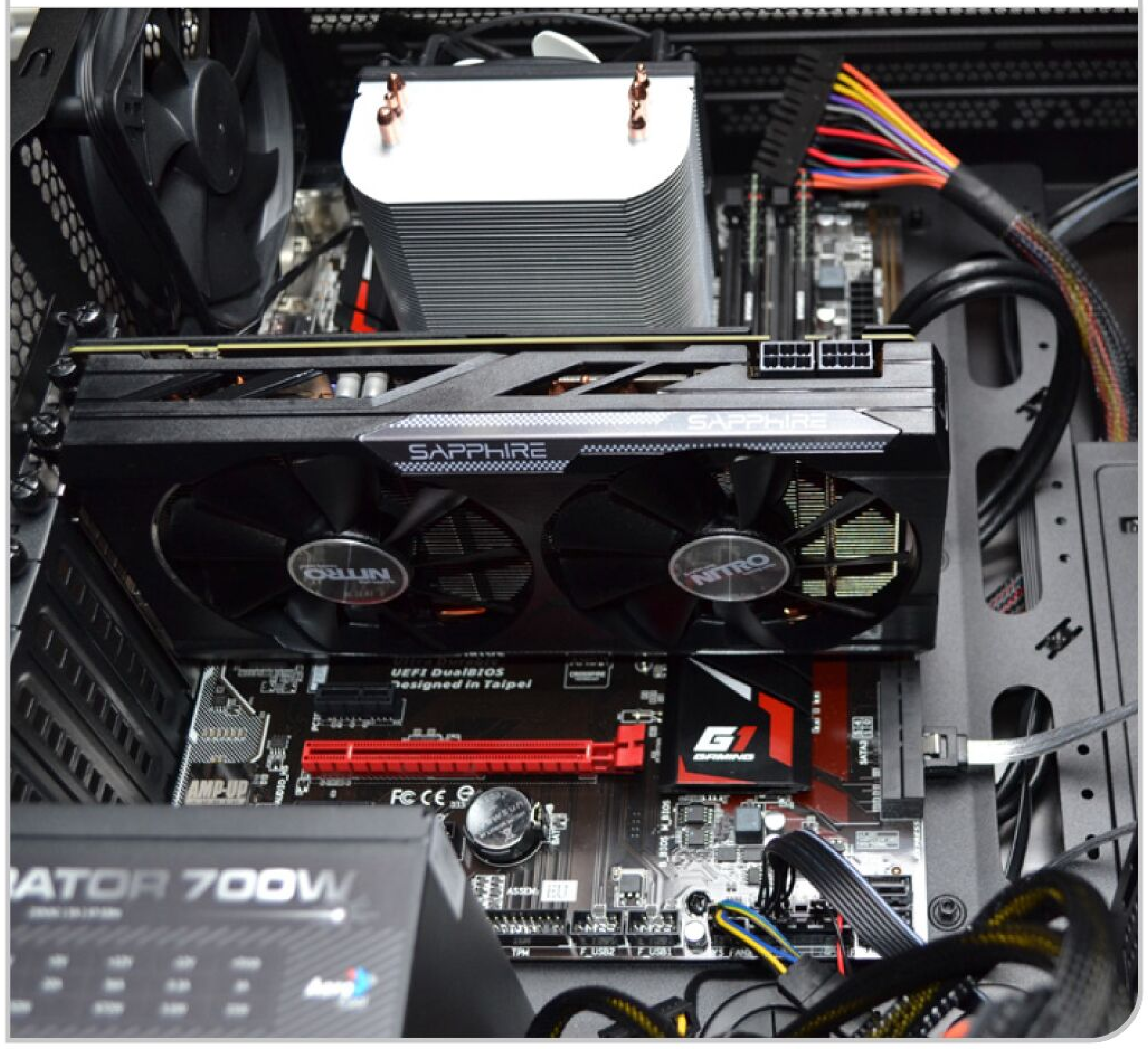
STEP 4 Press the card down from the top, evenly but firmly, until it clicks into place. Slide or flip the socket catch to secure it. Check that all of the ports such as HDMI, DVI, etc. are accessible from where they protrude from the expansion slot at the back of the case and then use the screws you removed to take out the blanking plates to secure the card to the edge of the slot.



STEP 5 Modern PCIe graphics cards, particularly high powered cards, will need to have a direct power supply, rather than being able to take power from the socket on the motherboard, and will have either one or two 6-pin connectors on the top or back edge. We will look at connecting the PSU in more detail later but for now it is worth checking that your PSU has the correct cable.



STEP 6 Many motherboards, especially gaming motherboards, will have a second PCIe socket. This allows you to run two graphics cards in SLI or Crossfire modes, assuming you have cards that are SLI or Crossfire compatible. The slots are normally spaced slightly apart to allow for improved airflow from the cards on-board fan but apart from this consideration, the above steps can just be repeated.



Adding the Power Supply Unit

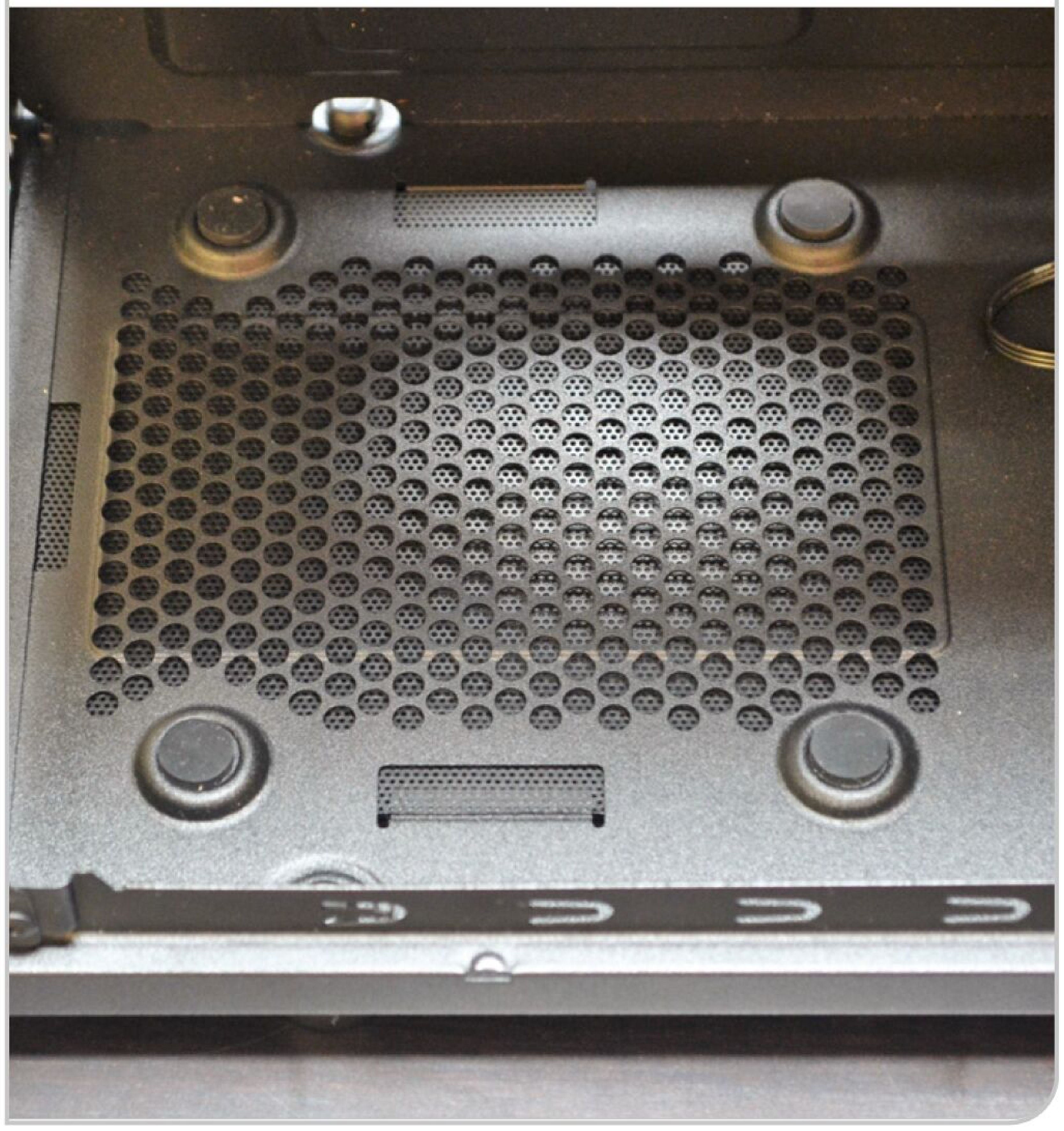
When you think about the important components of a PC build, it is fairly easy to overlook the Power Supply unit or PSU. However, if you do not match the PSU correctly with your other components, especially the graphics card, you may see a whole range of problems occur when you finally get the PC up and running. From simply not having the power to turn on, to intermittent crashes when gaming and random hardware faults, a weak or poor quality PSU is trouble.

Modular and Wired PSUs

Ideally you should buy a modular PSU that supplies more power than your initial build requires. If your budget doesn't stretch to modular buy a good quality wired PSU.

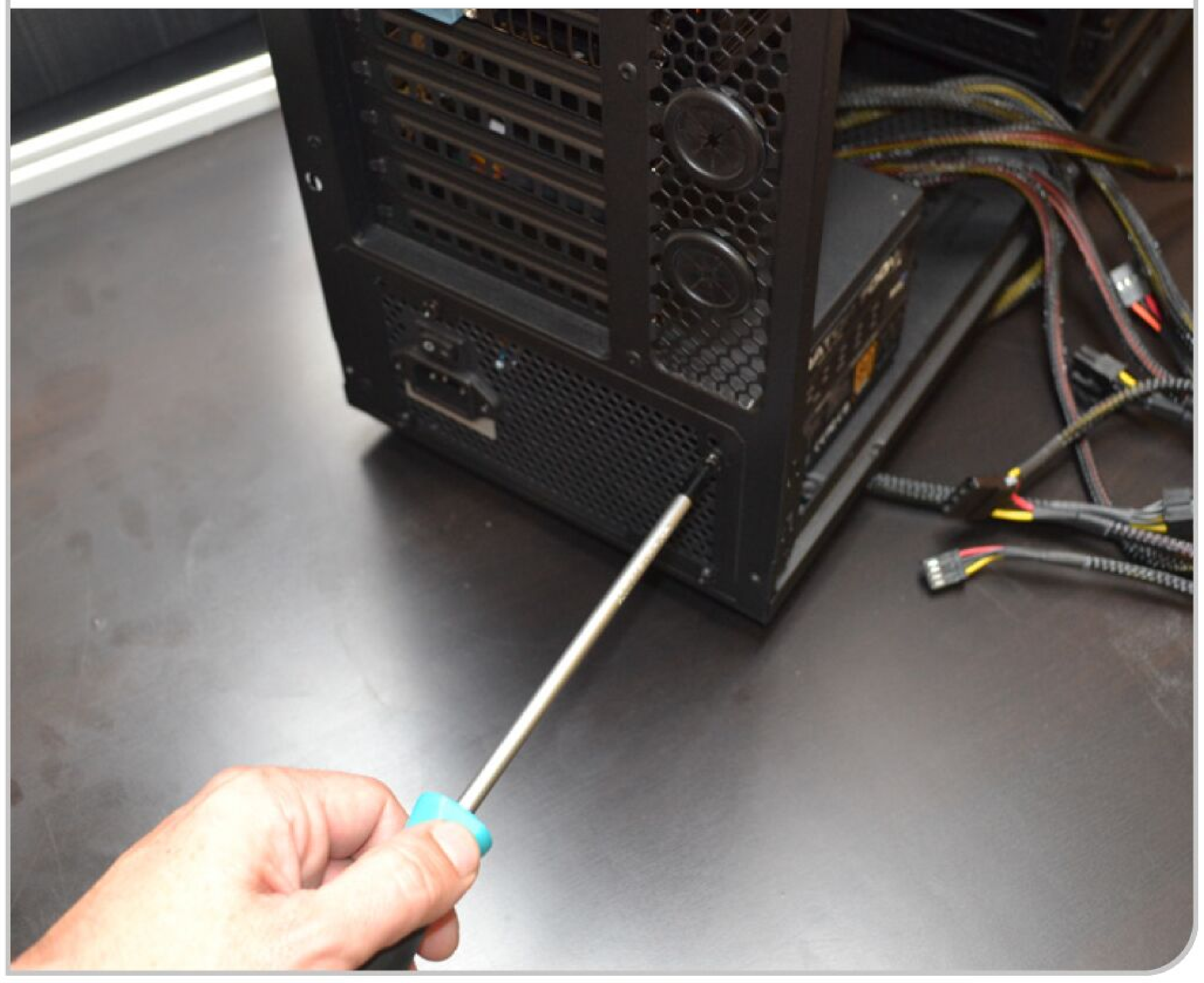
STEP 1 The case you have chosen for your build will dictate, to a greater or lesser degree, where your PSU is fitted, and how it is fitted. Some tower cases place the PSU mount at the bottom, as ours does, and some position it at the top. Ideally you want a case that features a vent covered by a filter where the PSU goes, allowing you to have the PSU fan facing out of the case.

STEP 2 Many modern cases also feature rubber feet for the PSU to sit on, in order to reduce the effects of any vibration and make the system quieter. These will normally be in place already but if not, check that they are not provided with all the other case components like screws etc. for you to apply yourself. Alternatively, you can buy small self-adhesive rubber pads from stationery stores.



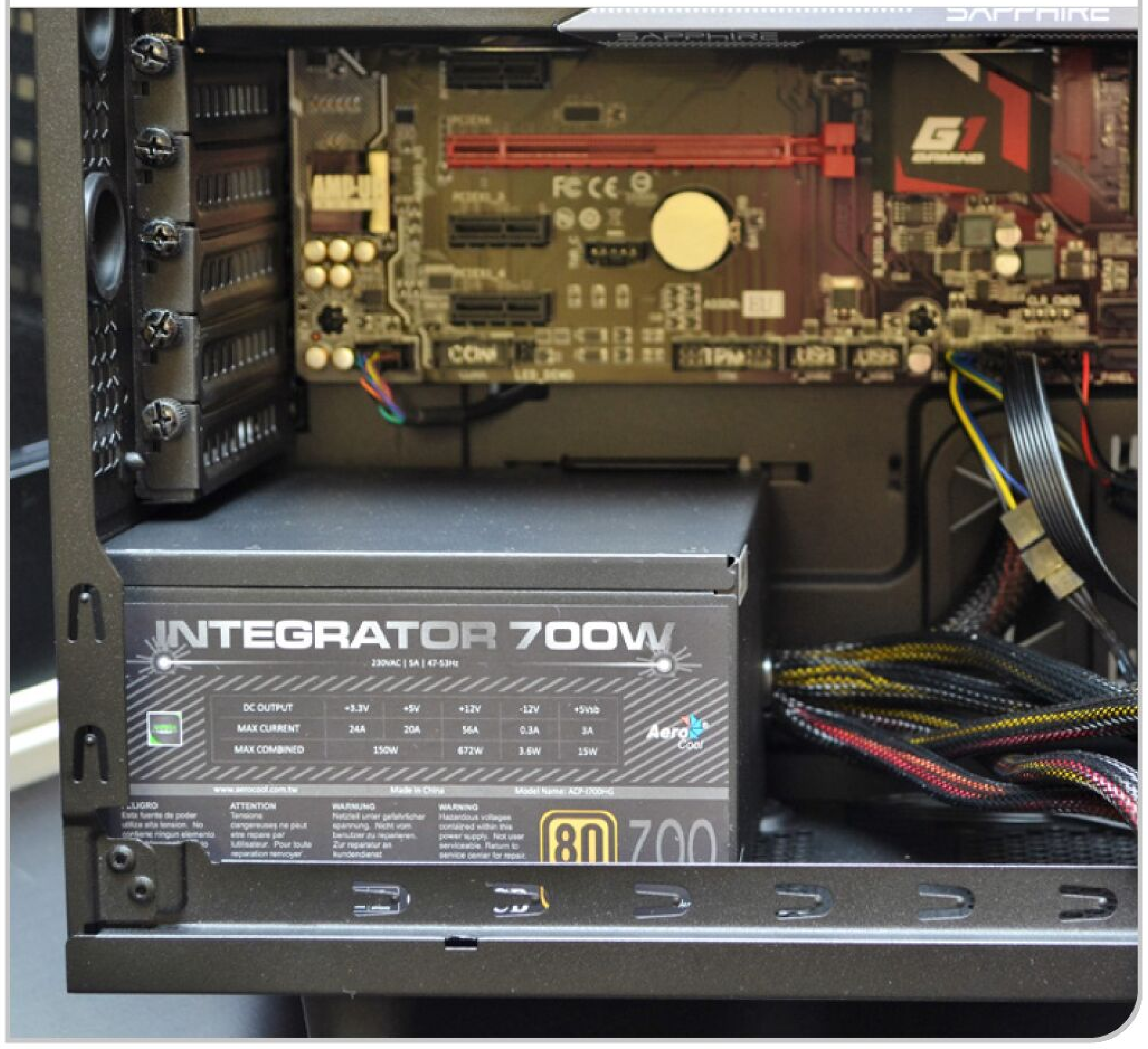
STEP 3

Position the PSU in the case, with the power socket facing out and the cables facing in to the case. The screw holes on the power supply will line up with holes around the edge of the PSU opening. The screws should have been supplied with the PSU but if not, standard case screws will do the job. There should be at least four screws holding the power supply in place.



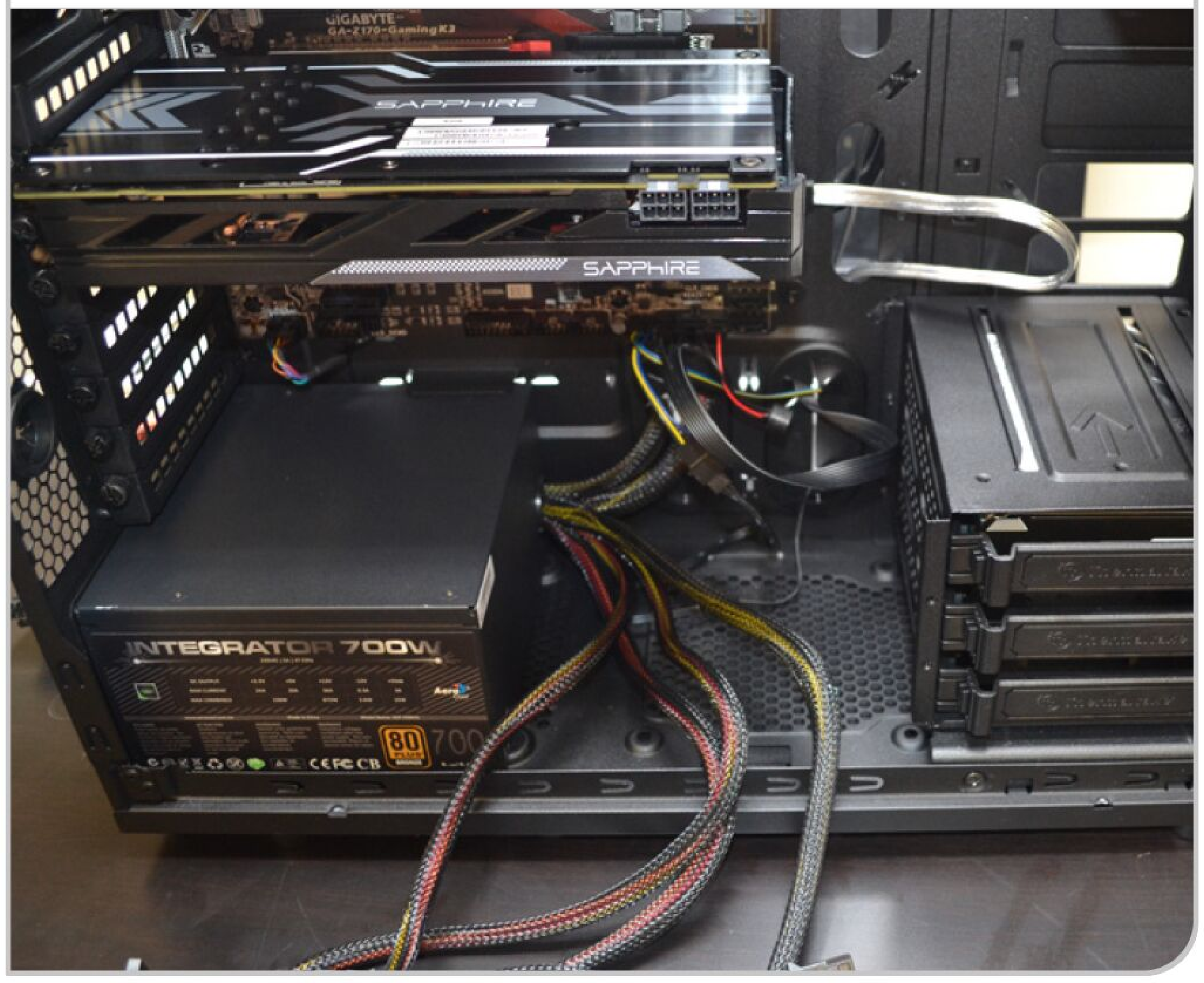
STEP 4

The bundle of wires coming out of the PSU may be tied or held together. Untie them and straighten them out. Some full tower cases are huge inside, and it is not unusual that the cables of the PSU aren't long enough to reach the 12v or 24-pin connection ports. If this is a problem for you and your PSU didn't come with extensions, you will have to purchase the ones you need.



STEP 5

If your case has cable management holes in the back of the chassis, you can start feeding cables through at the bottom of the case. Work out how many of the different PSU cables you need: probably a 4+4-pin, the main 20+4-pin, the PCIe 6-pin and a couple of SATA connections and tidy up the rest. If you are using a modular PSU, store the excess cables safely in the box.



STEP 6

Power related problems are often the cause of a system not booting (when we get to that point). Make sure everything is properly connected and that you haven't missed a power cable before checking for less obvious problems. Some power supply's let you switch the input voltage between 110V (US) and 230V (UK). Make sure yours is set correctly for your location.

Power Connections

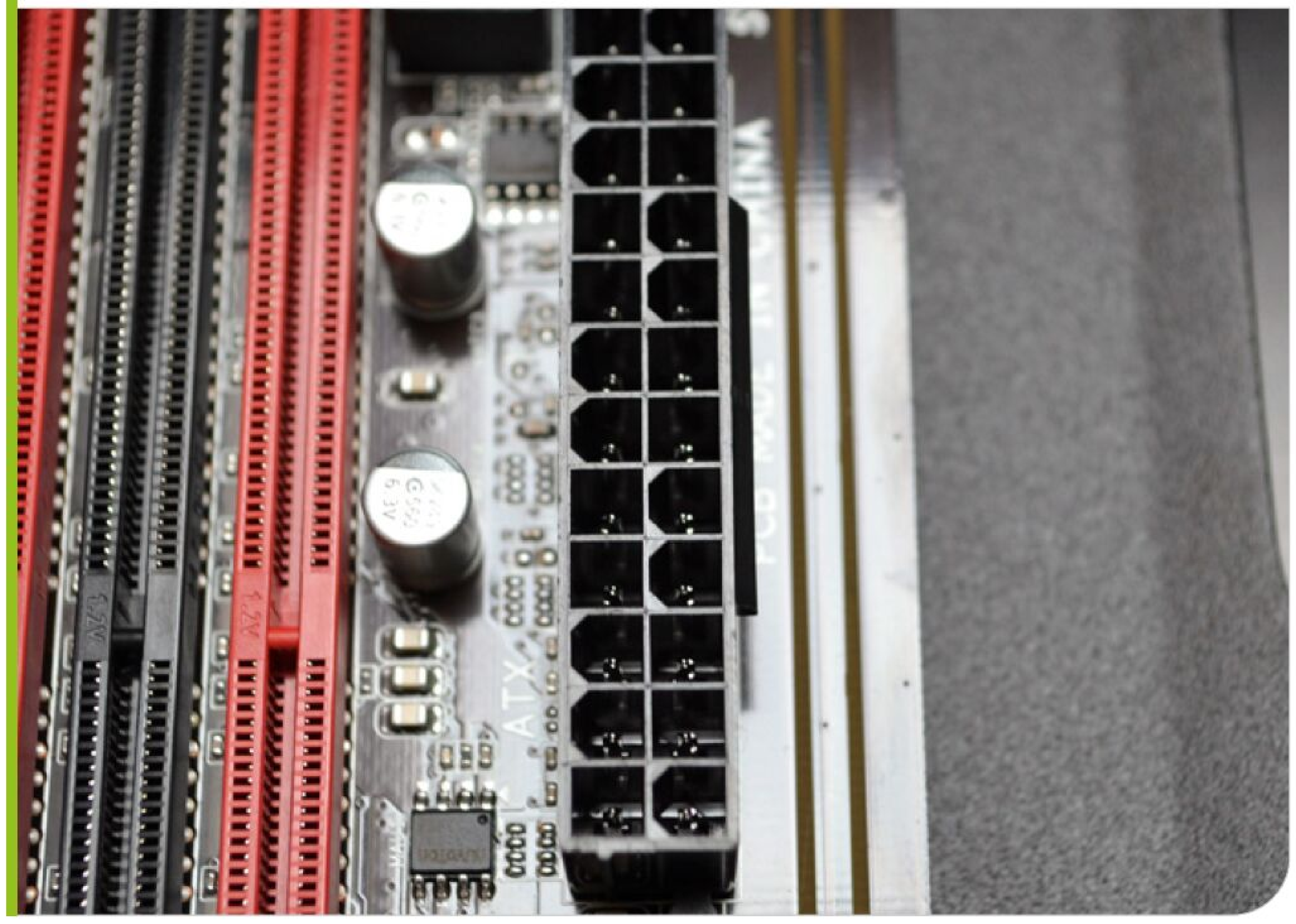
Finally, you can now begin to connect the whole system up to the power supply and take an important step towards the first boot. If you followed our advice earlier in the guide for planning your build, you shouldn't have any surprises when it comes time to connect everything up. If you do find that cables are too short, or missing completely, you can buy extensions and adaptors online easily.

Cables and Sockets

Connecting everything up should be fairly straightforward but it is worth taking your time to ensure connectors and sockets are lined up perfectly when plugging in.

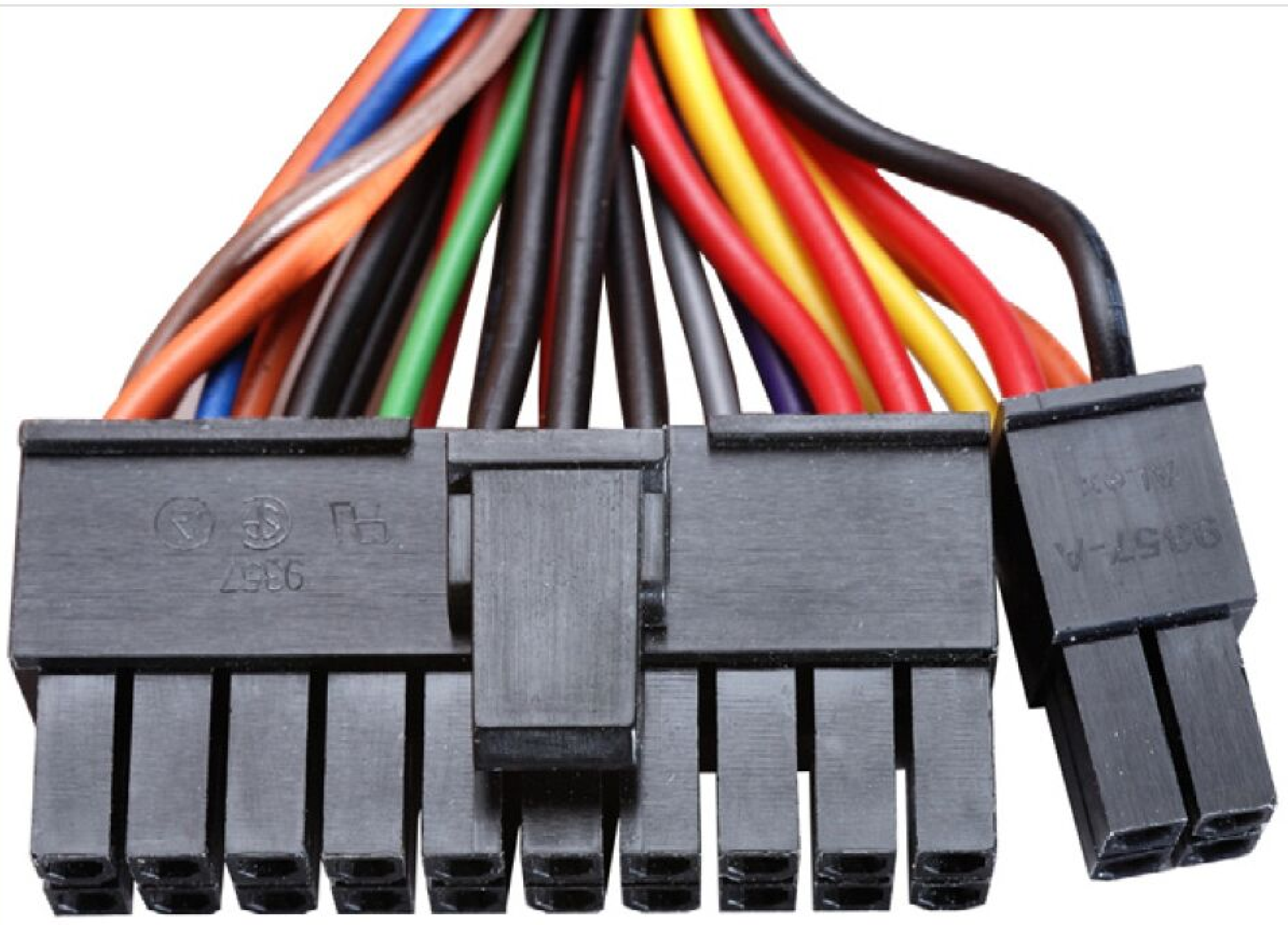
BEFORE YOU START

Take a close look at all of the main motherboard connections: the 4+4, 20+4 and PCIe. You will notice that they are made up of square and rounded pins. This helps to ensure that they can only fit one way; that pattern will match the holes on the relevant motherboard connector. The reason some of the connections are split is to accommodate different motherboard power requirements.



THE 20+4 PIN CONNECTOR

This is the main power connector for the motherboard, providing power for most of the on-board features. If you are using an ATX or mATX motherboard, you will need to use all 24 pins. Some motherboards will only need the 20 pin part; check with your motherboard manual or manufacturers website. Ensure it is lined up correctly and press it home, supporting the board as you do.

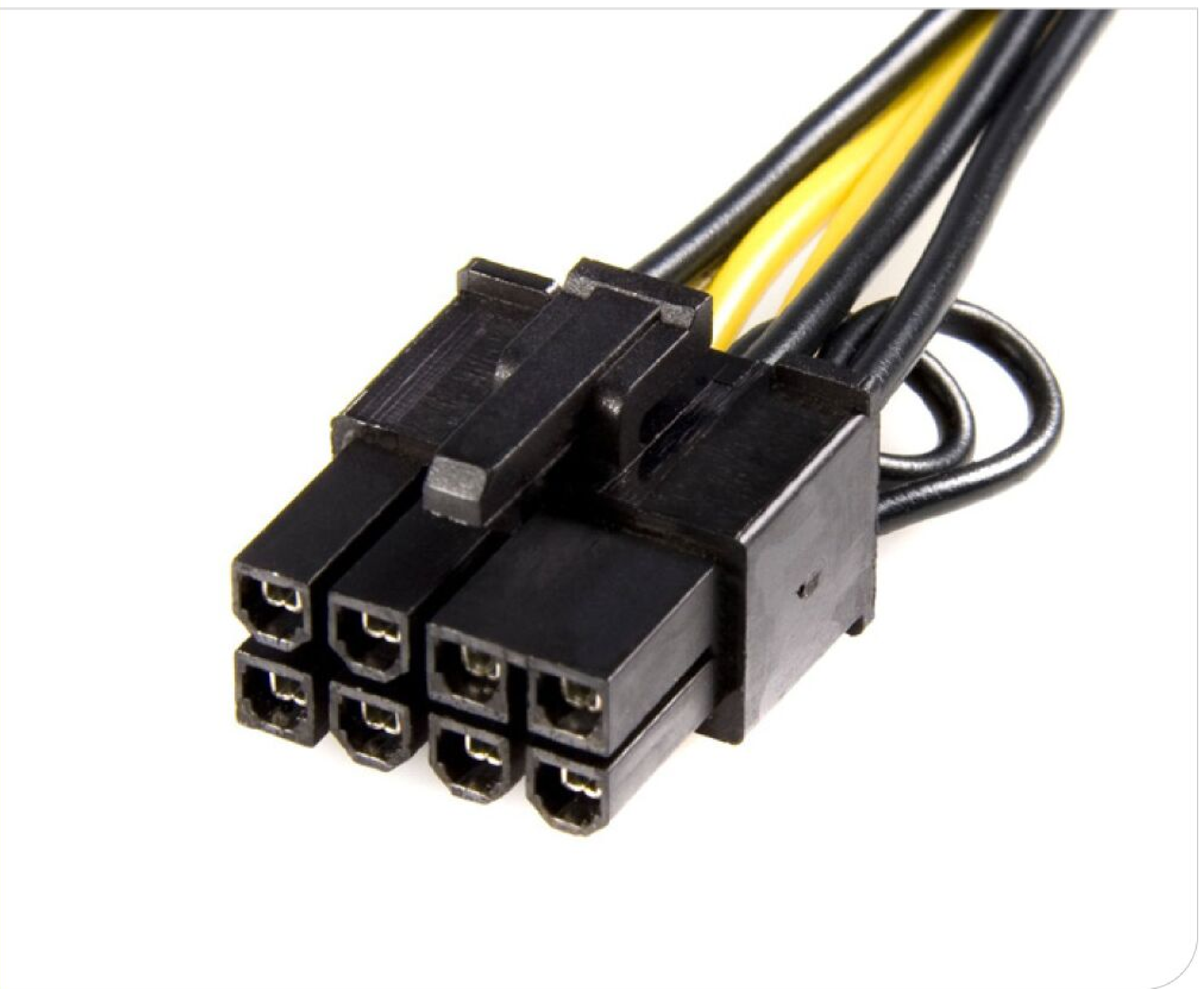


TFX POWER SUPPLY UNIT

The Thin Form Factor with a 12V connector (TFX12V) configuration has been optimised for small and low profile microATX and FlexATX system layouts. The long narrow profile of the power supply fits easily into low profile systems. The fan placement can be used to efficiently extract air from the processor and core area of the motherboard, making smaller, more efficient systems using common industry components a possibility. TFX PSUs are normally lower wattage than full size PSUs but should feature the same connectors.

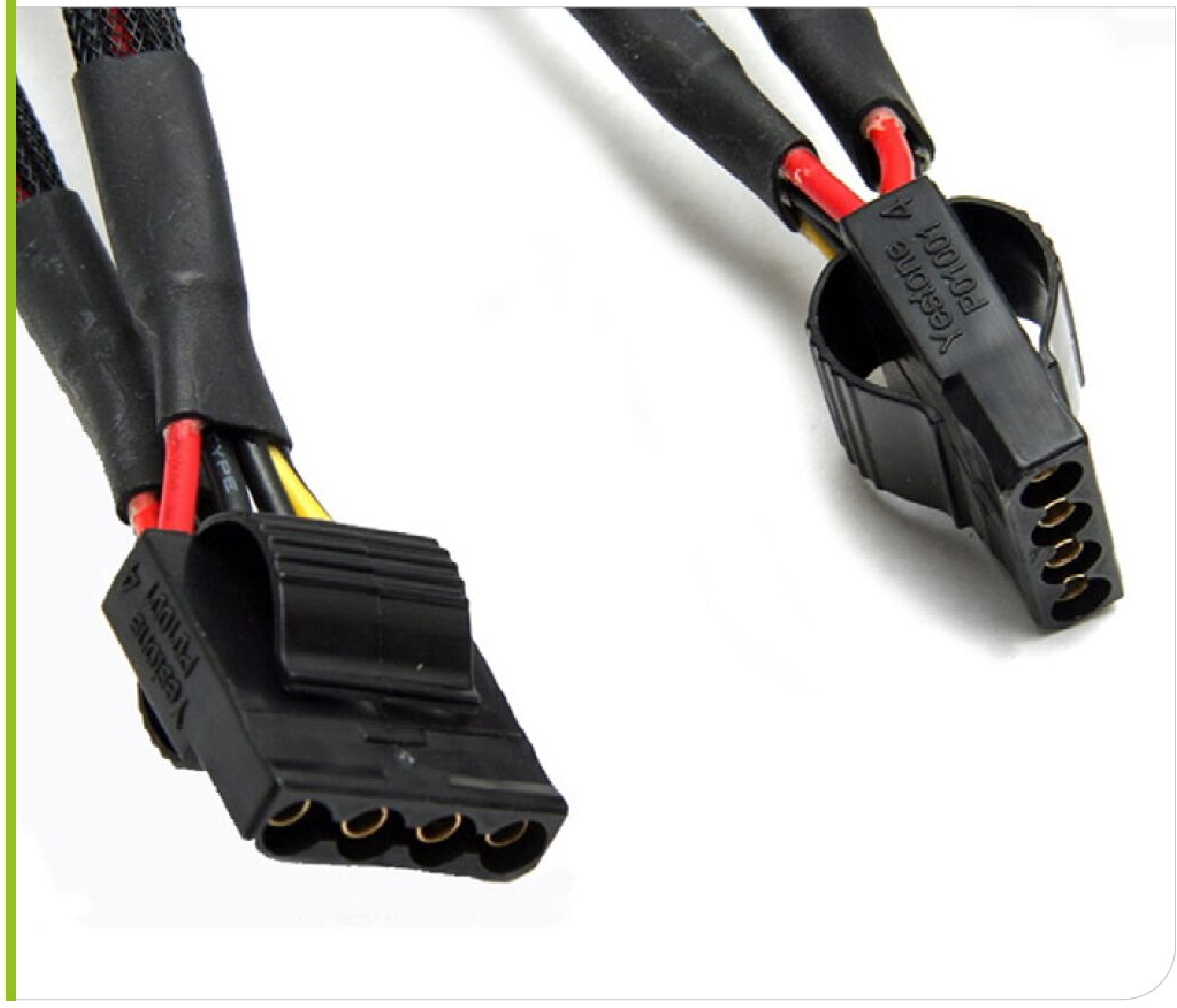
THE 4+4 PIN CONNECTOR

This is the power for the processor only and on modern motherboards that have modern CPUs, this will be an 8-pin connector that can split into two 4-pin connectors. If your motherboard and CPU only require a 4-pin 12v connection, just use either of the two. In some cases, the PSU will only have a single 4-pin 12v connector. As before, line up the pins and press firmly into place.



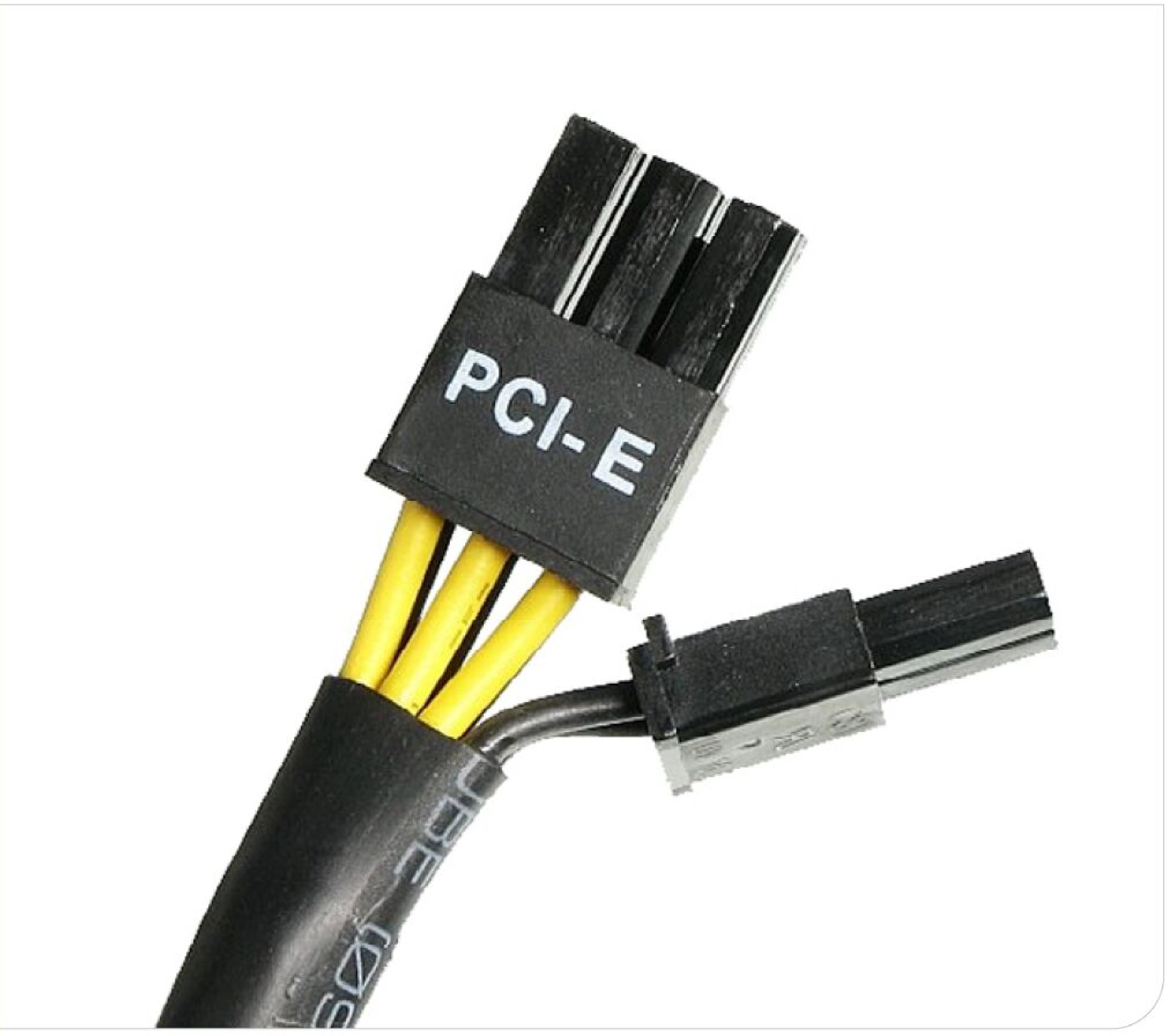
THE MOLEX CONNECTOR

Almost universally known as Molex, these connectors were widely used in older PCs to provide power to hard drives, CD drives etc. but have now been almost totally replaced by SATA connectors. You will almost certainly still see a couple of Molex connectors if you are using a wired PSU. On a modular PSU you can simply leave them in the box if you don't need them.



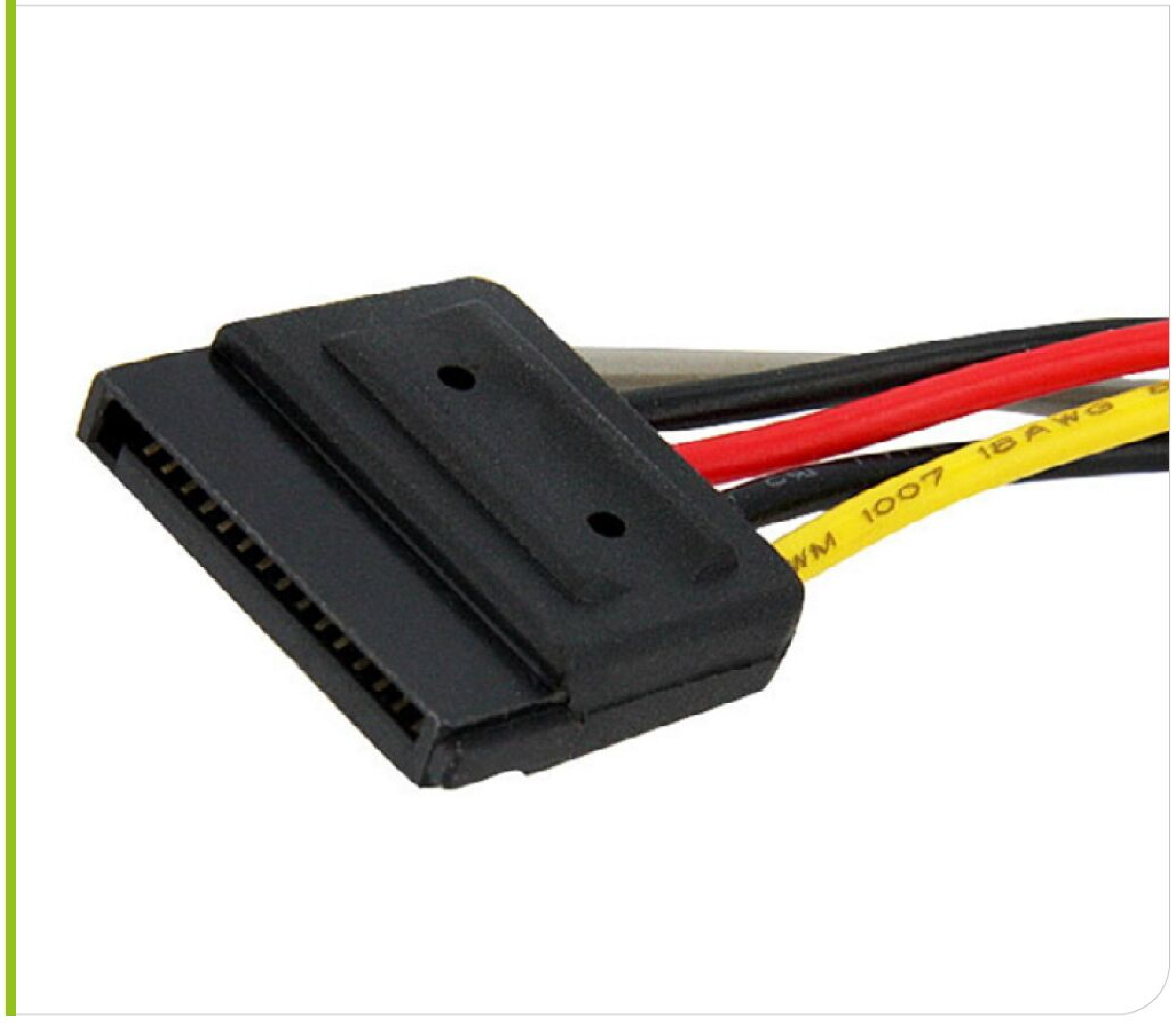
THE PCIE 6 PIN CONNECTOR

This cable is for providing dedicated power to your GPU (graphics card). Older cards were able to draw power from the motherboard but almost all modern GFX cards will need their own supply. The PCIe connector is normally an 8-pin, which can split into a 6 and a 2-pin. In our build the Radeon R9 card requires two 6-pin connections, which we were careful to ensure our PSU had.



THE SATA CONNECTORS

This kind of plug is used to provide power to Serial ATA (SATA) devices such as hard disk drives and optical disk drives. If your power supply doesn't have enough of these plugs for your system, you can convert any standard peripheral power plug (known as Molex) into a SATA power plug through the use of an adapter. SATA connectors are often daisy-chained on the same cable.



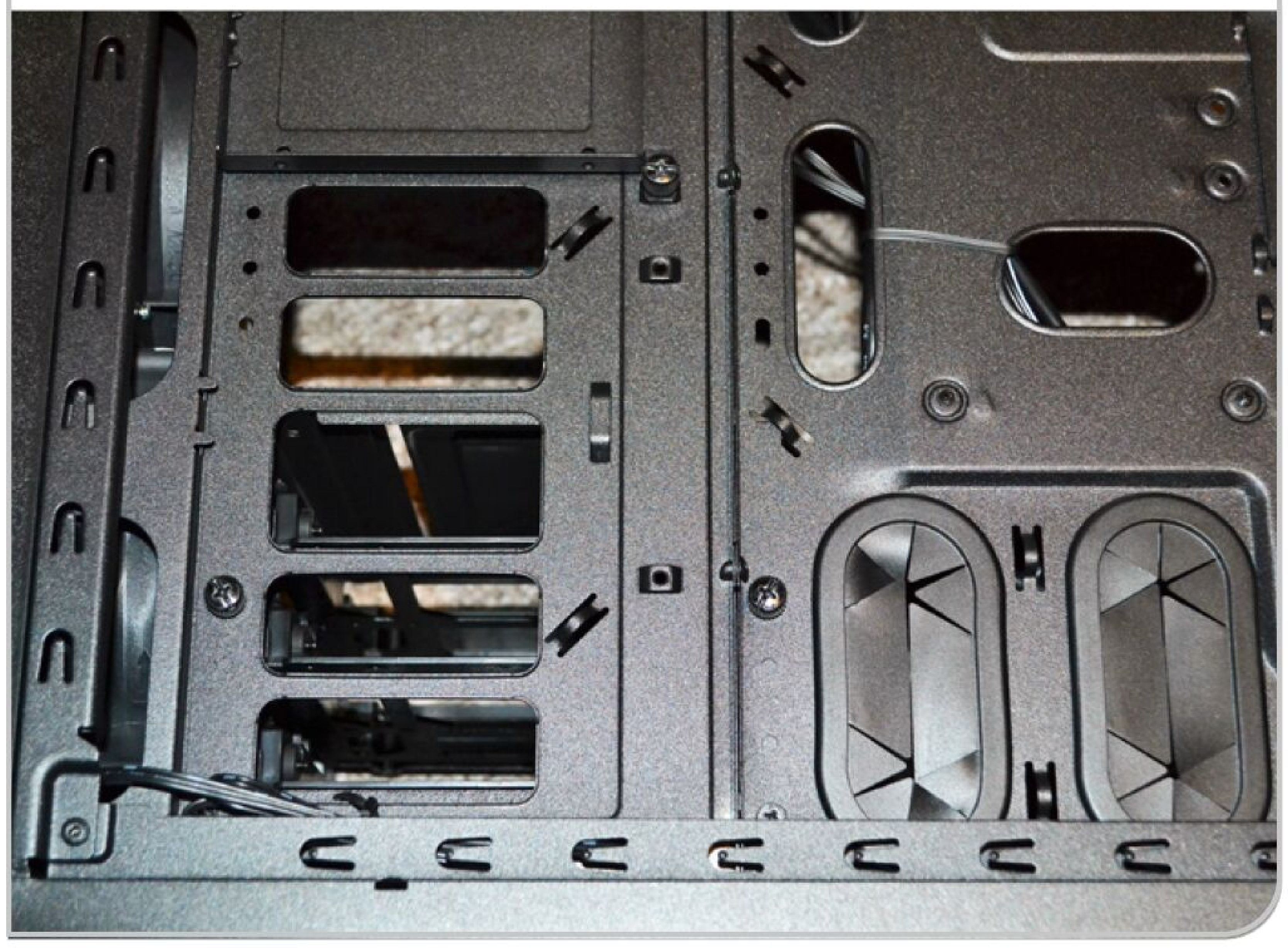
Cable Management

Although it may seem that taking time to tidy internal cables out of sight is simply down to personal preference, and how pretty you want your PC to look through that windowed side panel, but good cable management is increasingly seen as important for the welfare of your PC. Good airflow from the case fans is essential for keeping temperatures down and as thin as they may be, cables strewn all through the case will disrupt it.

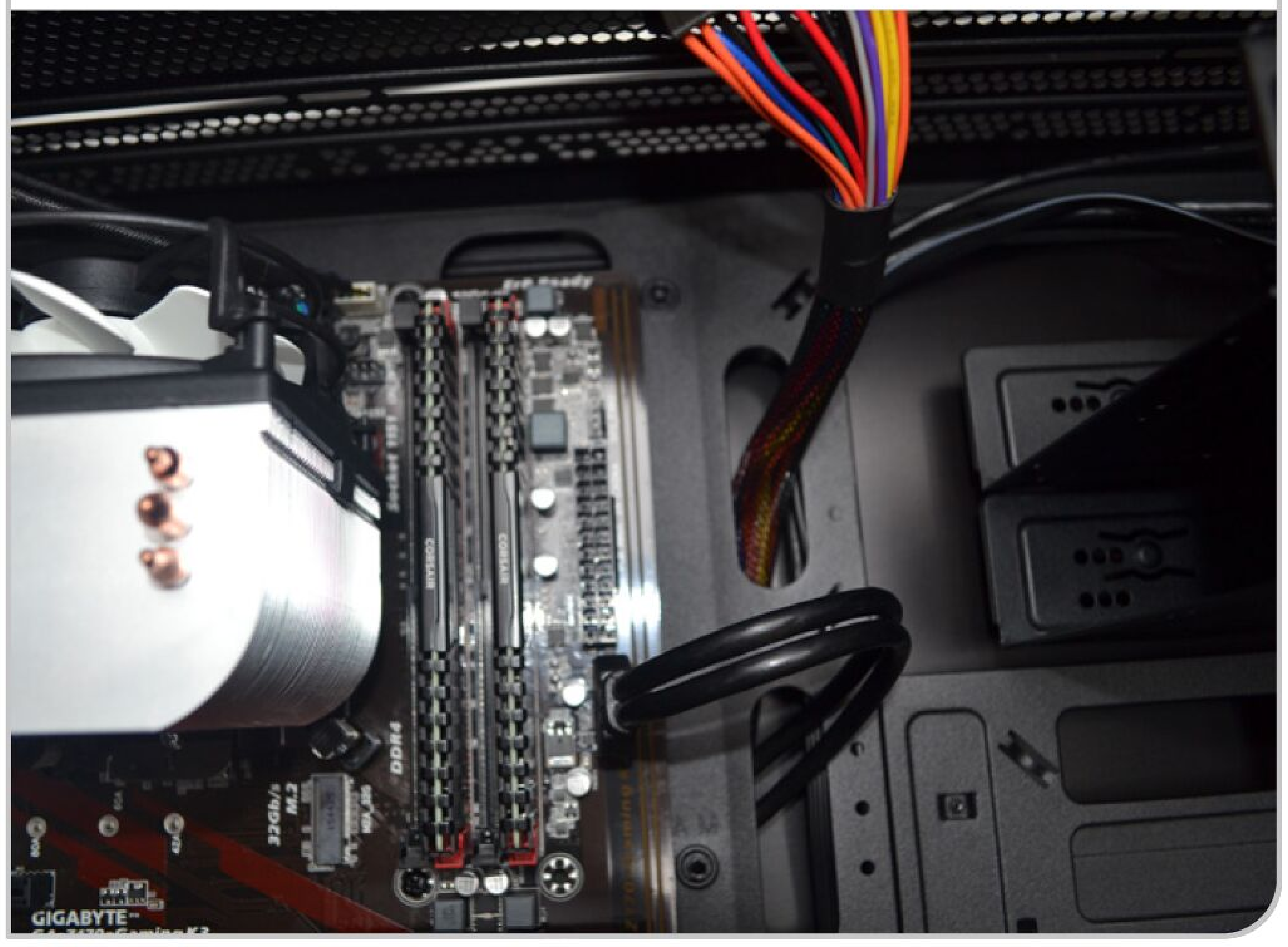
Planning Cable Routes

The amount of cable management you can do depends on the case you have chosen to use. Our Thermaltake case provides several options but this will vary greatly.

STEP 1 For a relatively cost-effective case, the Thermaltake Core V31 we are using provides exceptional cable management options. There are two large apertures at the bottom of the side panel, both protected by rubber grommets, through which we can feed all of the cables from the PSU. Our cables are sheathed anyway but the rubber further protects them from being damaged by the metal edges.



STEP 2 Once the cable bundle is fed through the fixed side panel, we can start feeding the individual cables into wherever they are needed. They can then be fed back through any convenient hole, so that the connectors are back in the main compartment and ready to be plugged in. When you are doing this, take a moment to ensure that the removable side panel will fit back on with the cables here.

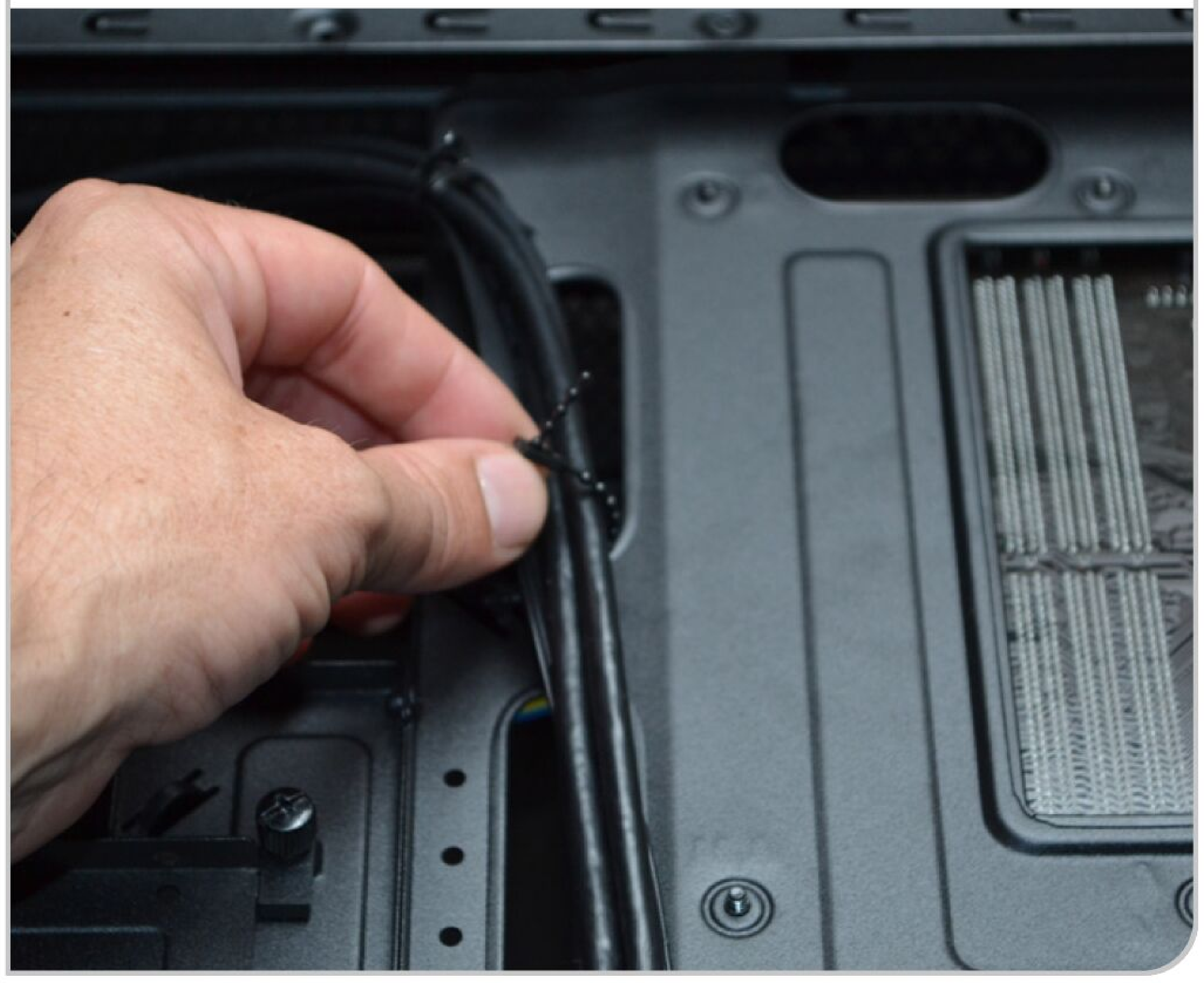


CABLE MANAGEMENT KIT |

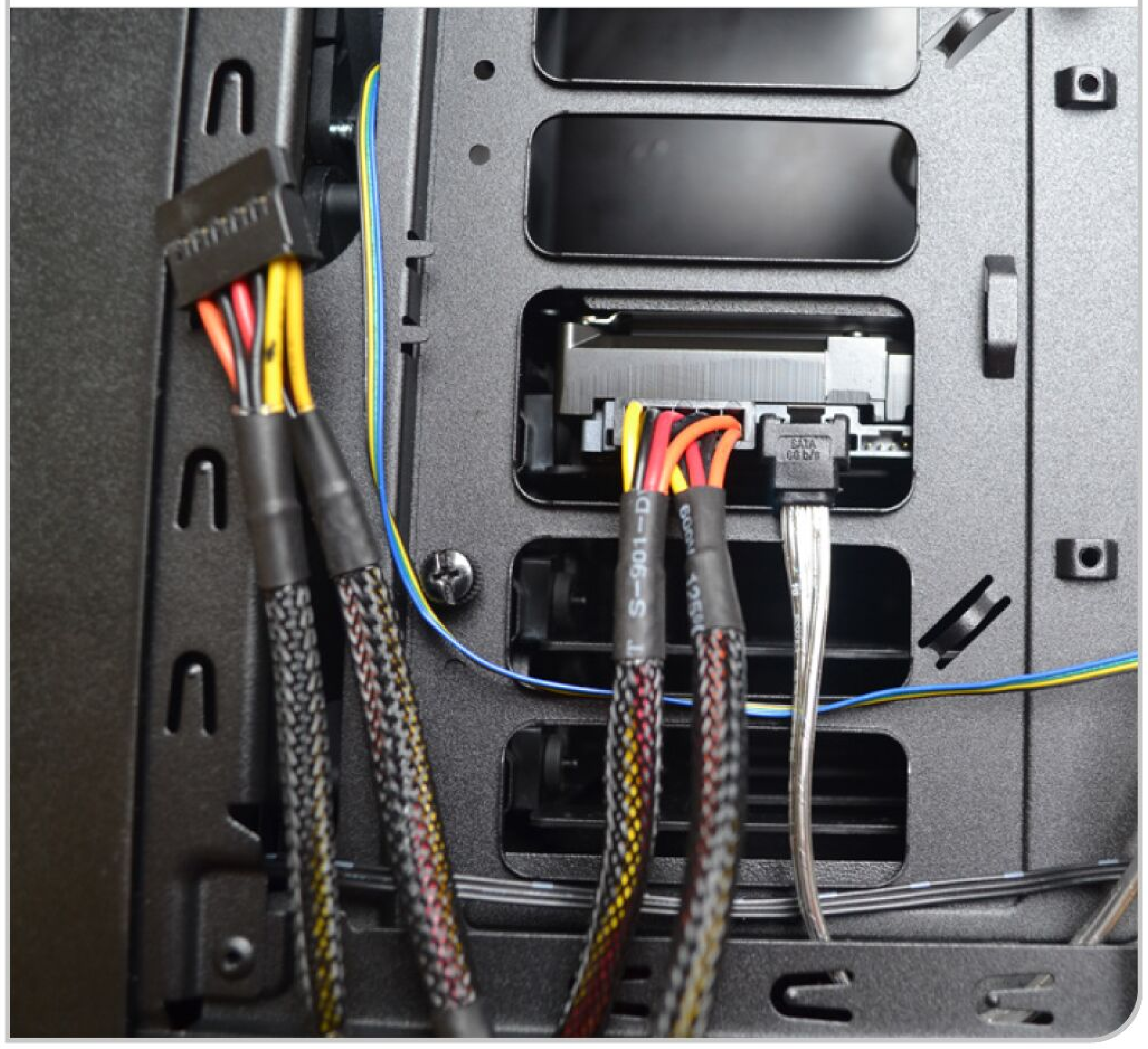
Cable management is not a one step action but more of an active process that involves considering the components you have, the components you may have in the future and the space you have to work with at all times. Before starting, we recommend gathering some basic equipment, including:

- Cable ties.
- Twist-ties or rubber bands (you can find cable tie kits on Amazon).
- A screwdriver and pliers
- Scissors or wire cutters.
- Electrical tape or gaffer tape. Ensure it is ESD compliant.

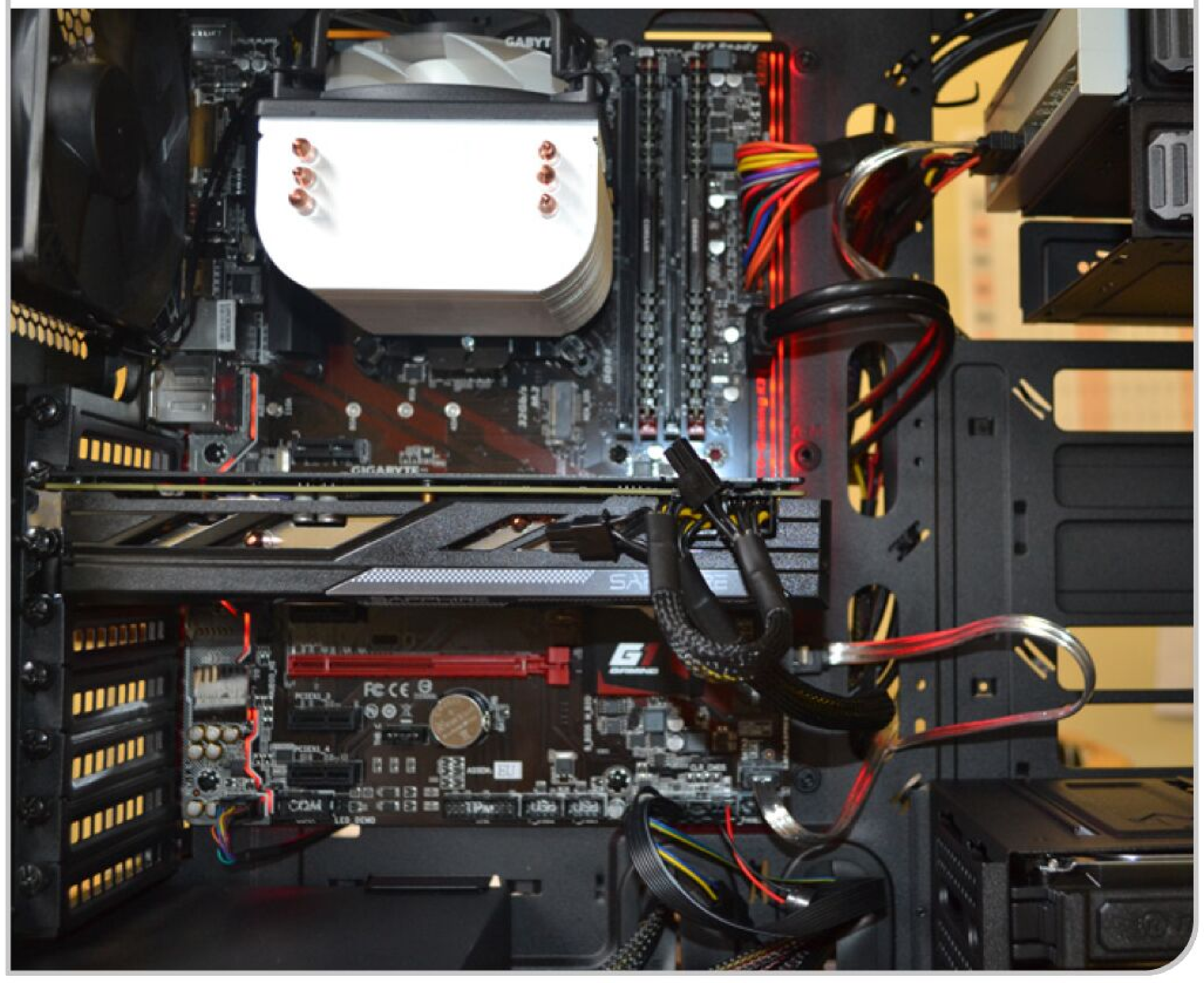
STEP 3 It doesn't matter too much how the cables run behind the motherboard but it is still a good idea to group them together where possible, and secure them into a bundle with plastic ties or a twist of plastic-coated wire. Again our Core V31 goes the extra mile, providing quick release cable ties and small lugs built-in to the back of the case to attach them to.



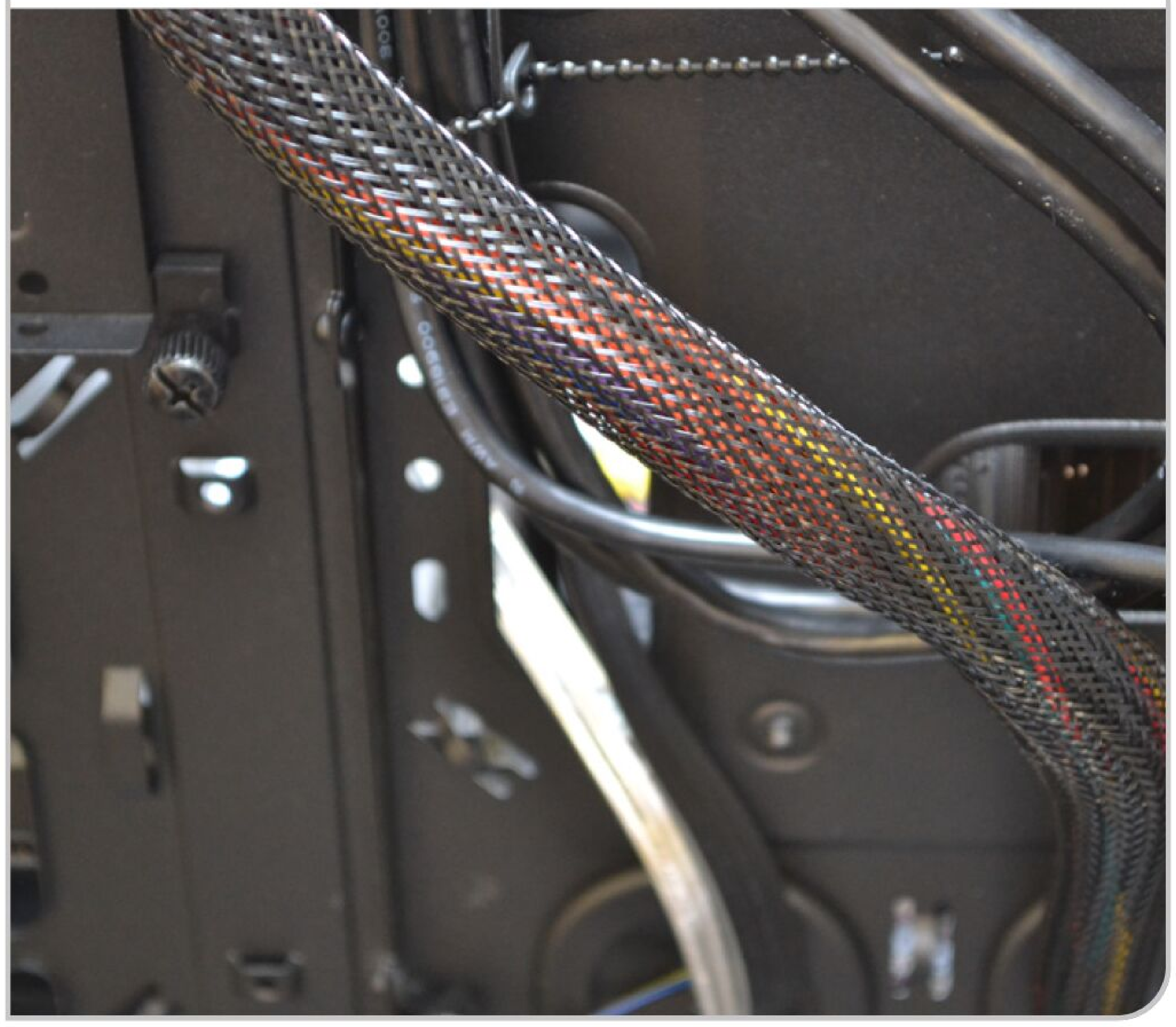
STEP 4 Some cables, such as the front panel audio, branch into two connections when you only need to use one. This usually means that a second connection branches off just before the main cable terminates. Fold the excess cable back on itself and tie it down to the main cable so it's out of the way. Do this for any other cables around the case, such as the PSU's SATA power cables.



STEP 5 Keep airflow in mind and don't cover any case fans or coolers with a cable if at all possible. The Component placement within a system is also important. Drives, graphics cards and other expansion cards should be positioned in such a way that their cables, or the components themselves, don't interfere with one another. Don't be afraid to move a component if needed.



STEP 6 If your case doesn't provide the sort of cable management features we have been talking about here, don't worry, you can still manage the cables. Planning is even more important, as you want as many of the cables as possible running in a single direction. These can then all be gathered together into a bundle, tied up and positioned against the side panel if possible. Not ideal but better than no management!



Final Checks and First Boot

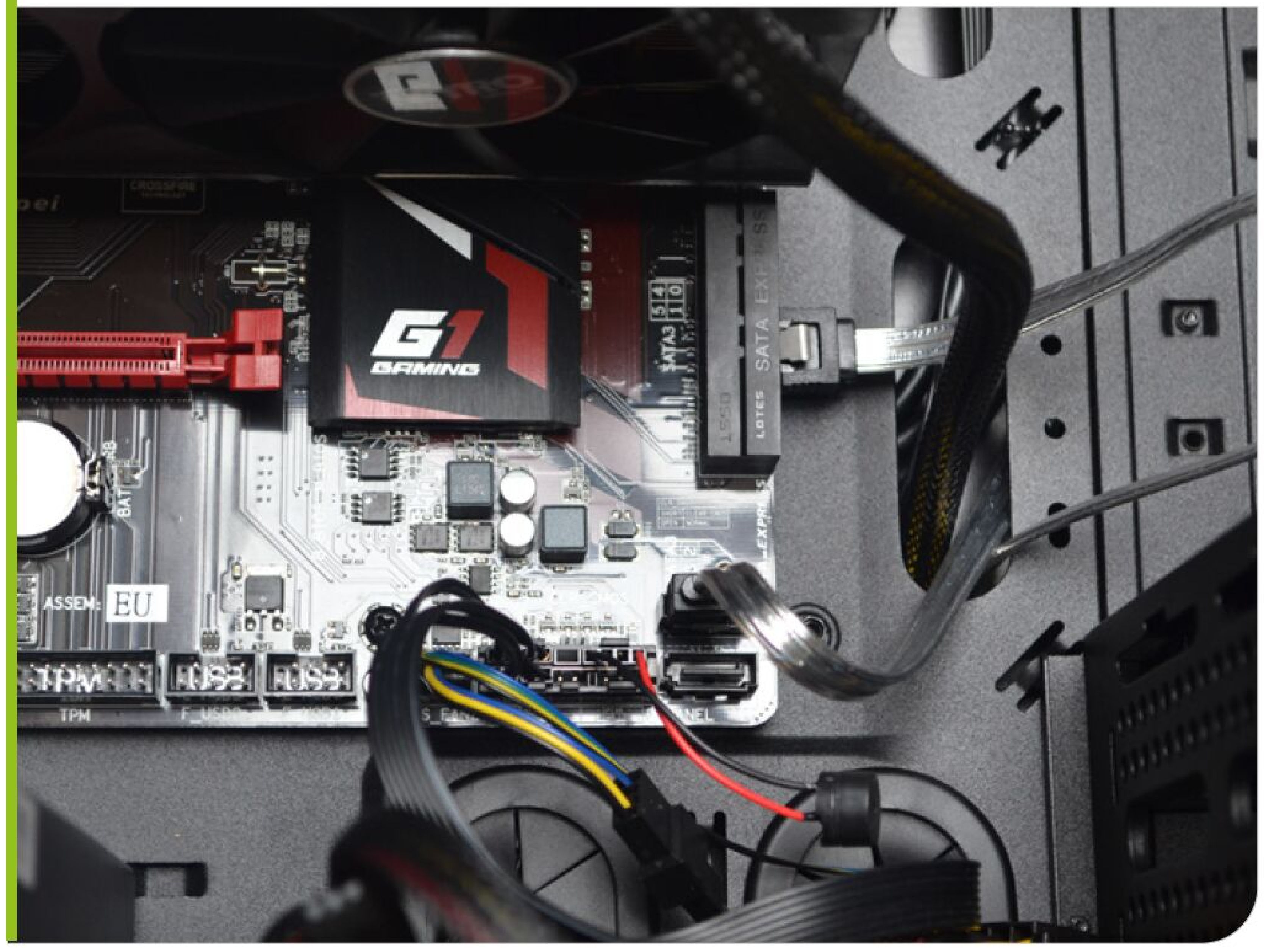
If you have followed all of the build steps thus far, you should now be at the point where the first boot up is looming. Before you do, it is worth going back and checking that everything is ready, all cables are connected and everything is looking good. First boot doesn't mean that you can't go back and change things later but you can avoid problems by doing a few simple checks.

Your Final Checklist

If you are sure everything is connected and hardware is installed correctly, you can skip this checklist; but if you want to double-check, here are the key things to look for.

1. FRONT PANEL

Make sure that all of the cables that are preinstalled in the case for the front panel controls are connected correctly, especially the power, reset, HDD LED and POST speaker. If you connected these wires at the beginning of the build, it can be quite easy to knock them loose when routing the larger cables around the case. Check the motherboard guide for details of this connection.



2. COMPONENT SCREWS

Whether these are normal case screws, thumb-screws or toolless fixings, make sure that all of the components are correctly and securely installed in the case. Don't over tighten screws but make sure they are all done up. Loose screws might mean a component being loosened in its motherboard socket, for example the graphics card, when external cables are connected later.

SAPPHIRE
NITRO

READ THE MANUALS

Even if they only have a few pages, always read the manuals that come with the various components, particularly if you are completely new to building PCs. There is often vital information that can prevent you from plugging something into the wrong place and damaging the whole build. Your motherboard manual is especially critical. If you don't get a manual in the box, you will be able to find one on the manufacturer's website.

file:///C:/Users/Russ/Downloads/mb_manual_ga-z170-gaming-k3_e.pdf

GA-Z170-Gaming K3 Motherboard Layout

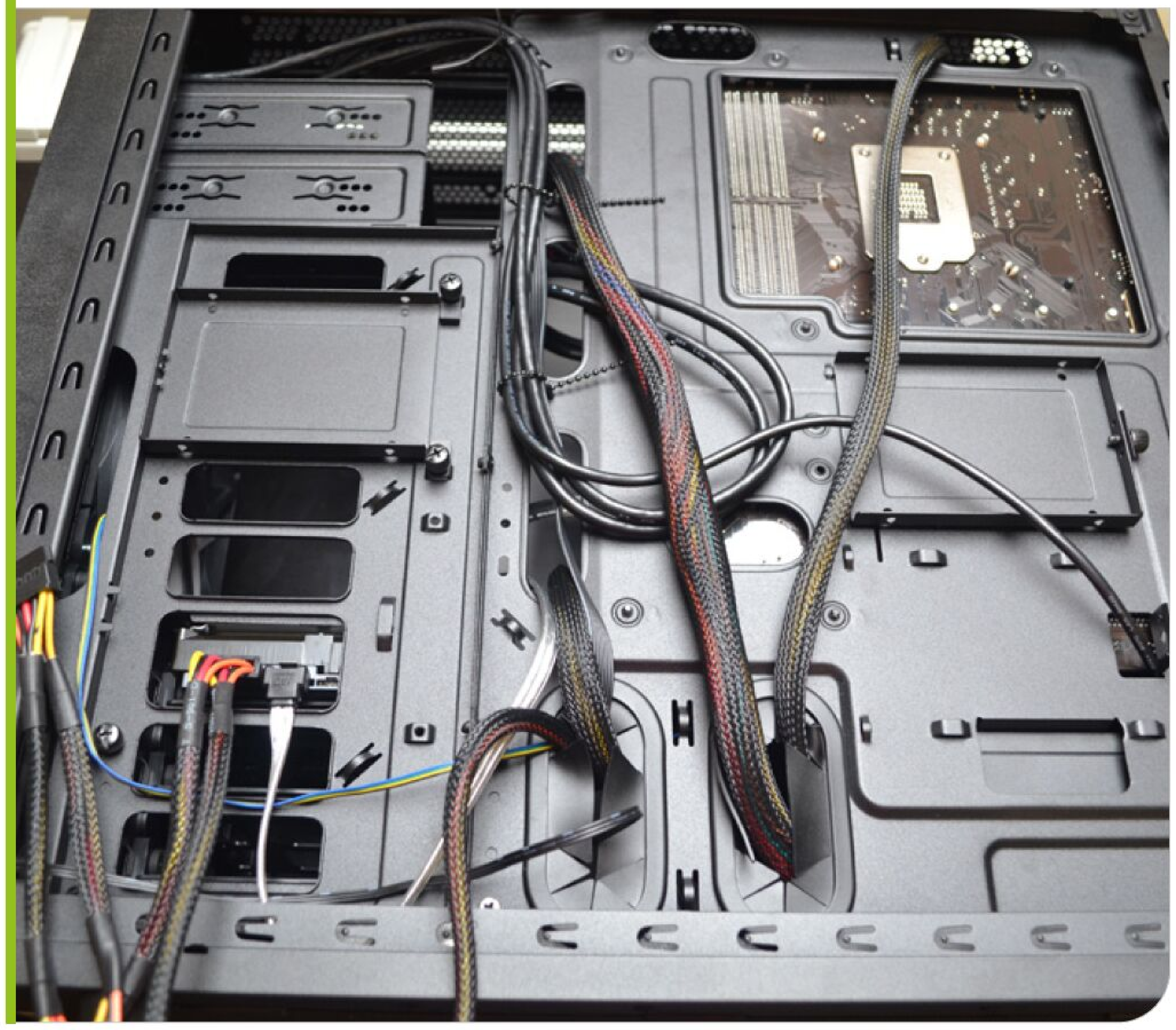
ATX_12V_2X4
CPU_FAN
CPU_OPT
LGA1151
R_USB31
HDMI
USB30_LAN
DVI
ATX

3. FANS AND COOLERS

Check that the case fans and the CPU cooler are all connected to the motherboard correctly. You really don't want to run your new PC for very long, and by that we mean NOT AT ALL, without the CPU cooler working and, to a lesser degree, the case fans working. If you have chosen to use water cooling, ensure that the pump and reservoir are connected correctly.

4. POWER CABLES

Check your cable management, make any improvements you want and check that all of the connections to the motherboard are clipped into place. Check again that the side panel that covers the back of the motherboard is not prevented from fitting by any routed cables, and then fit it into place. Barring problems or upgrades, you should rarely need to remove this again.



5. PERIPHERALS

Make sure you have everything ready to be connected to your PC. This includes the monitor, ensure you have the right cables for DVI, HDMI, etc., a mouse and a keyboard. Set your new computer up on a desk or table, rather than where you might normally have it (under a desk or inside a cabinet for example) so that you can see what is happening inside when you power up.

6. OS AND SOFTWARE

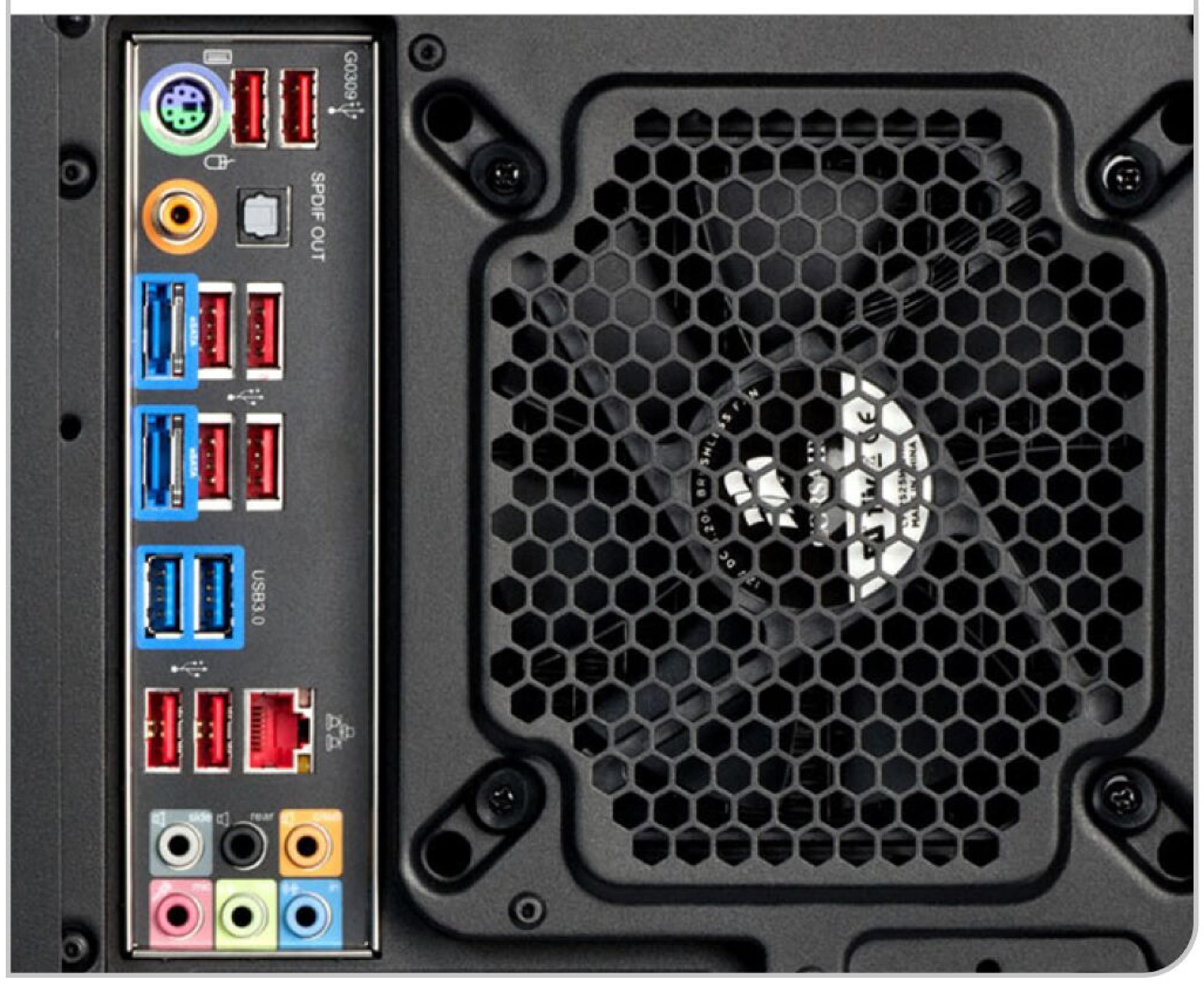
As this is a new build, you will have to install your chosen operating system from scratch. By far the most common is Windows, so we will deal with that mainly throughout this guide. If you decide to use Linux, you can check out our Beginners' Guide to Linux, on sale now. Make sure that you have your bootable media ready, either a Windows disk or a bootable USB drive.

Microsoft
Windows 10
Home
Windows 10
Home Full Version

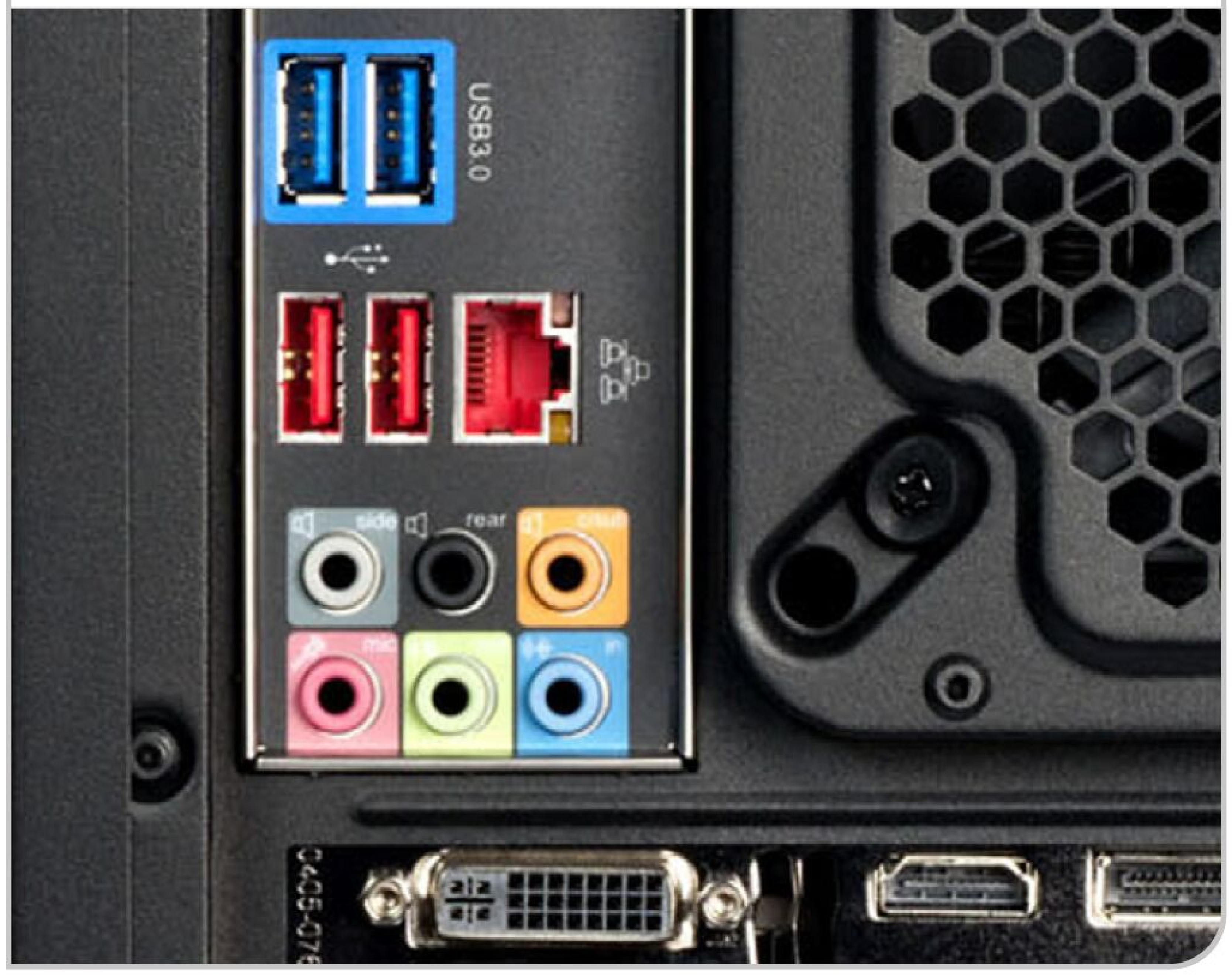
Connecting Peripherals

PC peripherals can be varied and include the monitor, keyboard and mouse along with speakers. If you don't have brand new peripherals for your build, you can use older ones you may have stored away.

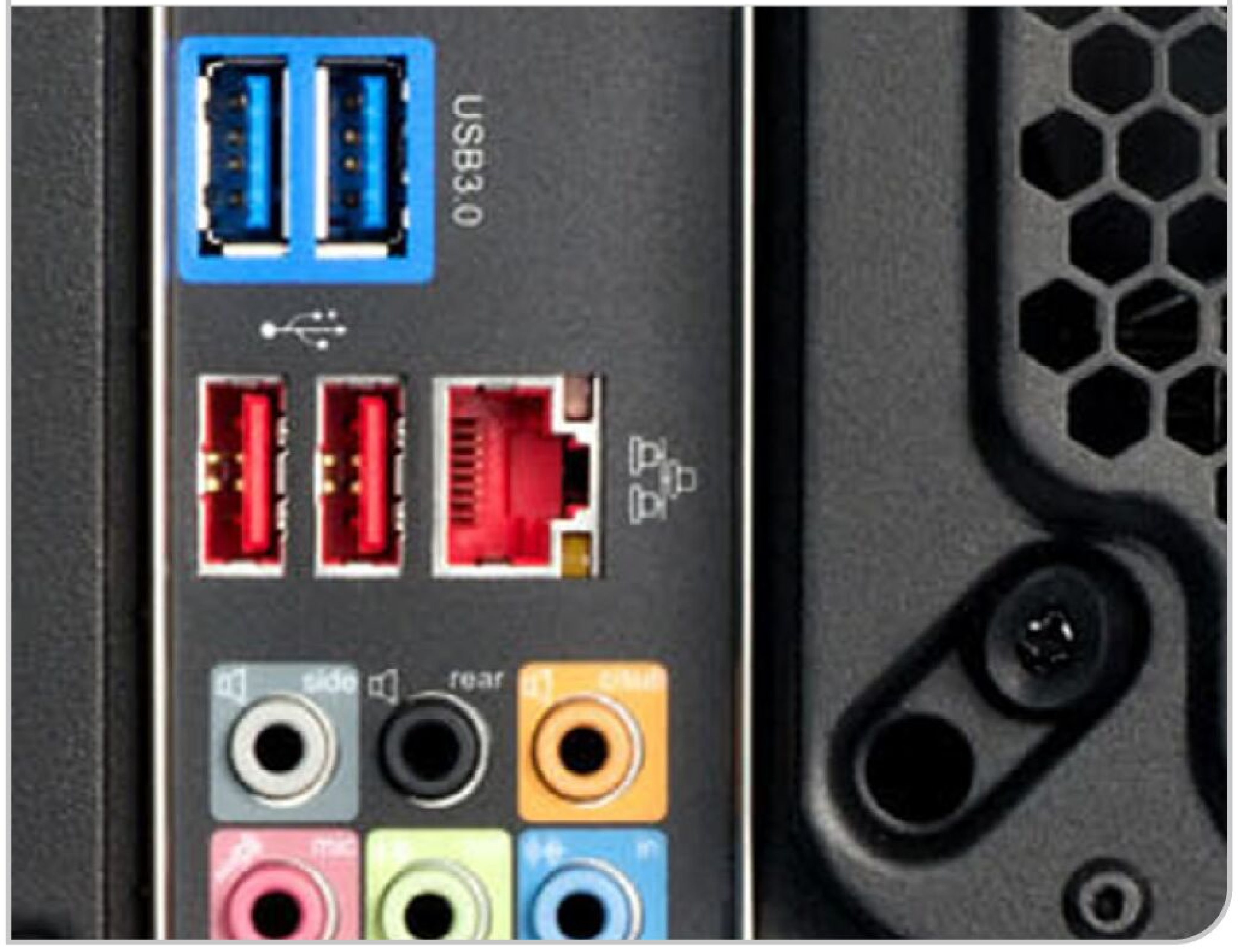
STEP 1 You'll need to connect a keyboard and mouse before you get started. Older keyboards and mice use PS/2 connections, which your computer should have. Most new keyboards and mice use USB, or a USB dongle if they're wireless. Connect either of these to the rear USB ports.



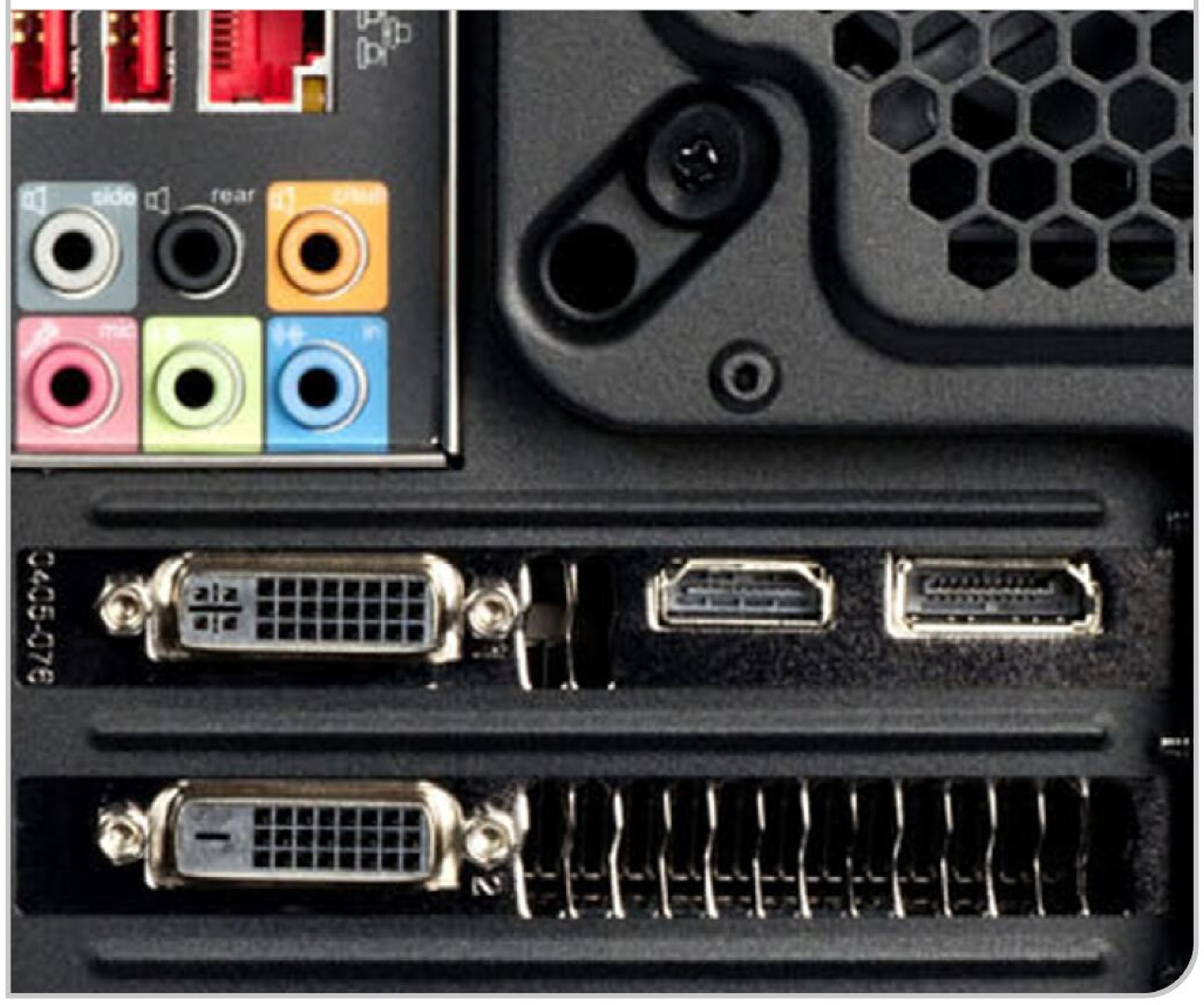
STEP 2 If you have a set of speakers that you'd like to use, connect them now. If you're simply connecting a pair of stereo speakers, connect the 3.5mm audio cable from the speakers into the green audio jack on the back of the PC or into your dedicated sound card. Surround sound speakers require more connections. Simply match the colour-coded cables with the matching coloured ports.



STEP 3 If you're planning on using an Ethernet cable for networking, connect it to the Ethernet port on the rear of your PC. The other end of the cable can be connected to your router or Wi-Fi bridge. If you have an external Wi-Fi aerial, you will need to plug this into one of the USB ports on the rear panel of the tower.



STEP 4 Most motherboards have onboard graphics, which are fine for most tasks. However, if you've invested in a graphics card to play games then you'll want to use the outputs it provides. You'll have a selection of outputs, including VGA (also known as D-sub), DVI and HDMI and possibly DisplayPort.



First Boot

You are not trying to achieve anything with this initial start up, other than making sure that everything is connected properly and your PC works.

STEP 1 After the final checks shown above, and connecting your peripherals, you are ready to test all of your hard work with the first boot. It is a good idea to leave the side panel off of the case for this first start up, so you can hear if everything is running. Many modern fans, drives, etc. are extremely quiet. As a rule, you shouldn't run your PC without both panels in place as it affects airflow.

STEP 2 Plug in and press the power button. If you have included a POST speaker, you might hear a single long beep. Your fans should start up, have a look to make sure they are all working. If you have any ambient lighting on your motherboard (ours has this, as do many current gaming motherboards) it should come on too. If there is no response from pressing the power button, turn the page to troubleshoot.

RESET
USB3.0
USB3.0
writemaster™

Troubleshooting Your Build

Hopefully, if you have followed all of our instructions carefully, you won't have any problems during the first boot of your new PC. However, problems can and do occur, even for experienced builders. The difference between a beginner and an experienced builder is the ability to solve problems and troubleshoot the PC build. If you have a problem with your computer, it will likely be one of these.

PC NOT POWERING UP |

If when you press the power button for the first time, nothing happens at all, there are a few things you need to check before you panic. Even if the system seems totally dead, it is unlikely that it is something as major as a full motherboard failure. In most cases, even defective motherboards will still light up their diagnostic LEDs or fans will spin for a few seconds, so no power at all is probably due to something else.

- **Is the tower plugged in?**
  It may seem like a stupid thing to ask but even fairly experienced PC builders (like ourselves) can make this simple error; and if it is plugged in, is the outlet turned on or the extension power block connected?

- **PSU Switch.**
  Everything plugged in correctly? Then check the switch on the PSU itself. Is it switched to On and is the power cable firmly seated in the PSU socket? If you are reusing an old power cable, check that the fuse is ok and swap for a new one if needed.

- **Internal Power Connections.**
  If all the external power connections are sound, it is time to check inside the build. Ensure that the main power and the ATX12V connector (a small 4 or 8-pin connector) are both firmly attached.

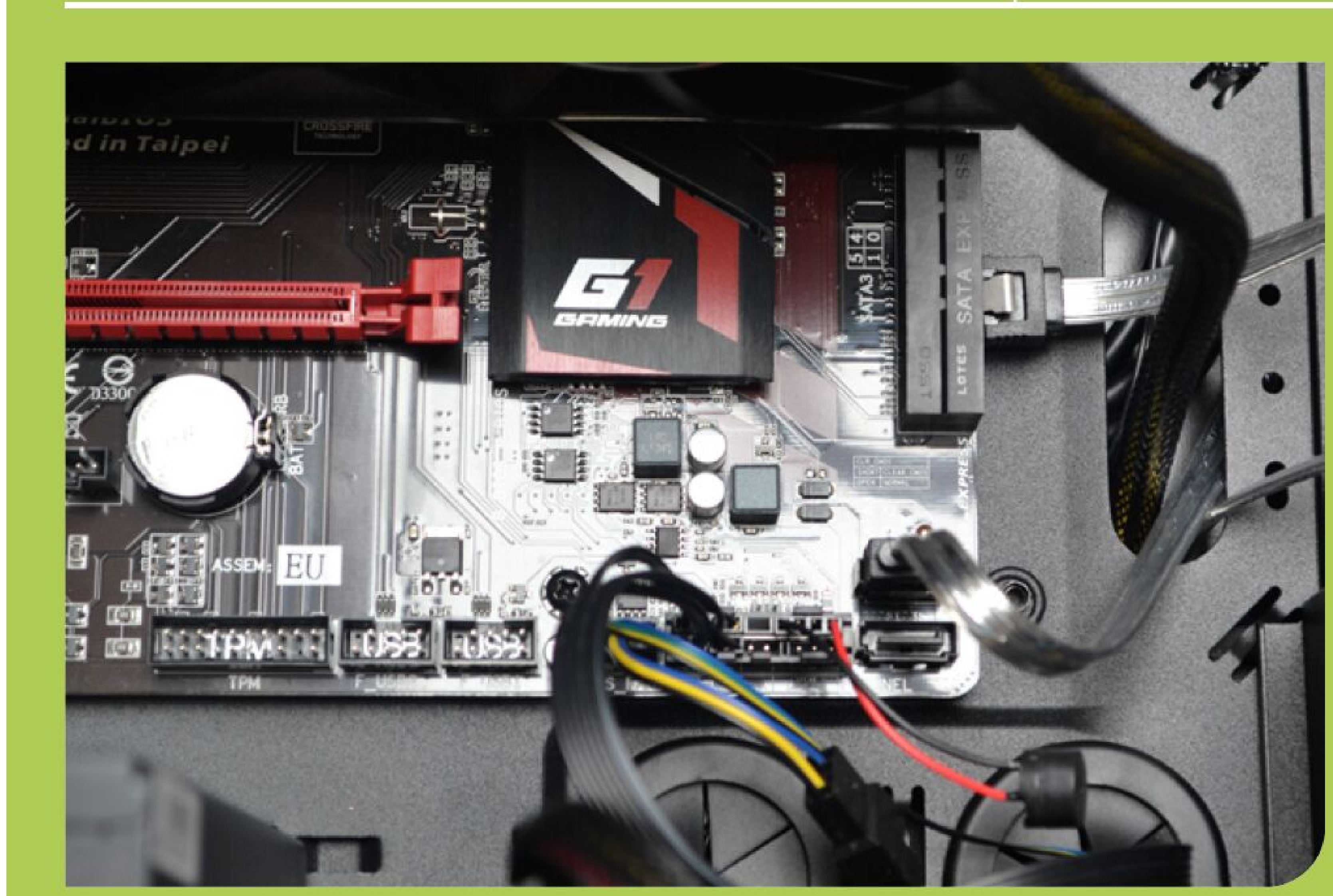
- **Check the Power Switch.**
  It is all too easy to mess up how you connect the wires from the front panel header to the motherboard, so check this next. It is possible to have the power switch connected as the reset button and vice versa. Check that the wires are firmly attached to the back of the button itself.

- **Check the Motherboard.**
  You might have a grounding problem. A motherboard mounting nut installed in the wrong location inside the case can create a ground fault in contact with the back of the board. If you need to check under the motherboard, remember that you will have to remove components such as the graphics card.

- **Try another power supply.**
  A dead power supply will obviously prevent a system from powering up.

CORSAIR
VS550

POWER BUT NO STARTUP |



- **Motherboard Connections.**
The first thing to do is check every single connection on the motherboard, from SATA cables to power supplies. Pay particular attention to the CPU cooler and make sure that it is both properly connected to the fan controller on the motherboard and that the wire is not damaged. If the system detects no fan on the CPU, which will overheat and die incredibly quickly without a fan, it will shut itself down automatically to prevent damage.

- **Power Supply.**
The next thing you should check is that your PSU is powerful enough to run your system. If the PSU is only just up to the job, it may result in this situation, where it tries to kick in but then stops when not enough power gets through to the motherboard. If you followed our guide on choosing a power supply, this should not be a problem.

POWER-UP POWER-DOWN CYCLE |

In this situation, the system enters a power-up power-down repeating cycle, where it looks like it is booting but then hangs and restarts. This is potentially a major concern as it can be a sign that the motherboard is defective. If it's not the motherboard, then make sure the CPU and memory are properly seated.

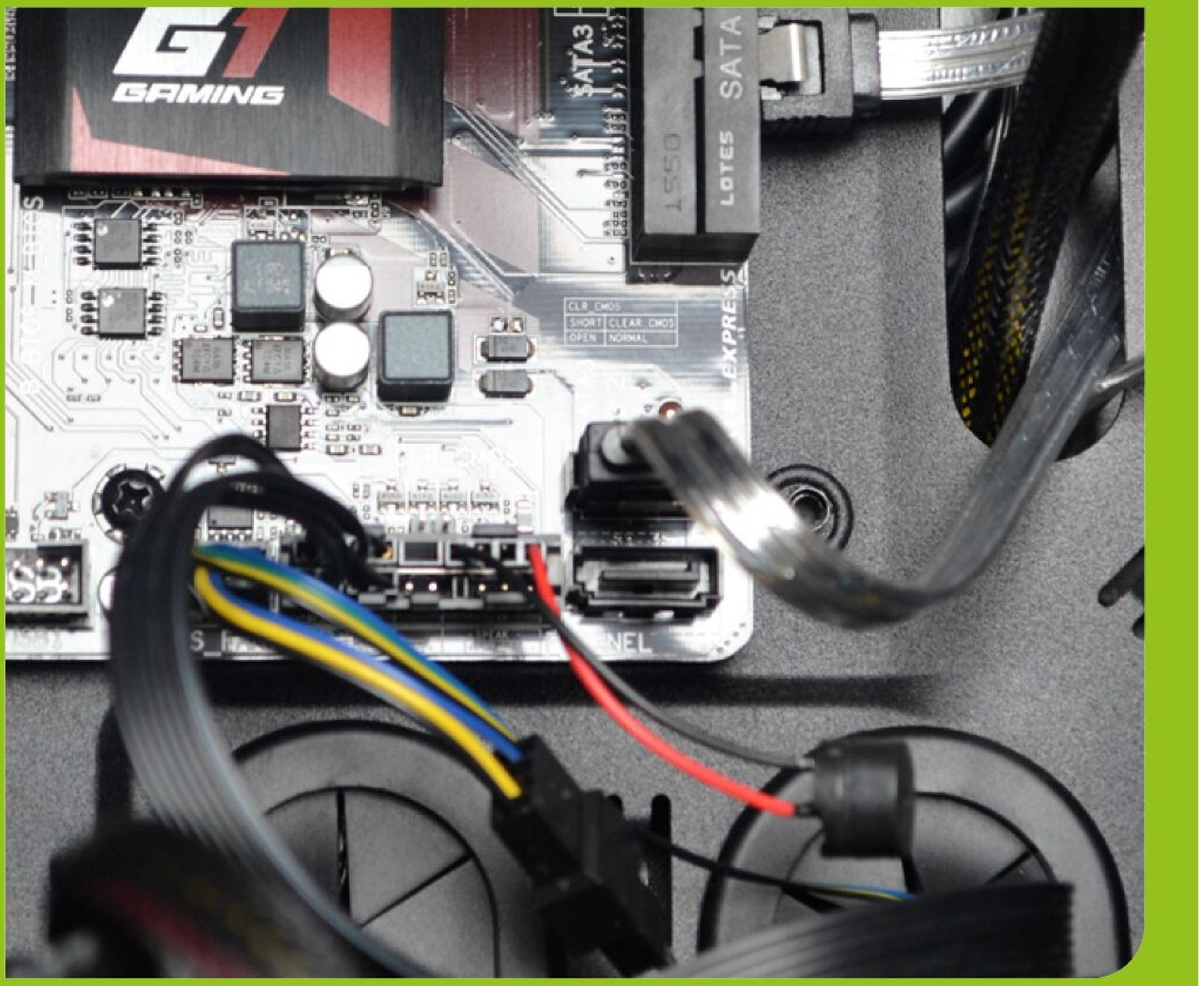
This can sometimes be a problem when using an older PSU in a new build. Newer motherboards with current generation graphics cards may require higher startup current than some of the older power supplies can deliver. This results in the system trying to start but struggling without enough power to run everything it needs to.

DIAGNOSTIC BEEPS/CODES |

If you fitted a motherboard speaker, usually attached to the front header panel contacts, this can really help you to figure out what is wrong. If the computer emits a beep sequence other than a single beep then something is wrong. The beep code emitted will give an idea of what the problem is. Beeps can be short or long and can be emitted in a sequence, such as one long and two short, and they can repeat after an interval.

What the beep sequence means for you depends on the motherboard and the BIOS type you are using, as different manufacturers use different sequences. Check in the motherboard manual to see if the sequences are explained or check the manufacturer's website.

Some modern motherboards feature a small LCD diagnostic screen on the rear panel. This will display error codes, rather than beeps, that you can then look up in the manual or on the website. Another potential feature is diagnostic LED lights. Again, the pattern of lights shown can be looked up via the manual or website. Let's have a look at the beep codes for our Gigabyte motherboard and two different types of BIOS.



Award BIOS
1 short beep = System normal
2 short beeps = CMOS Error
1 long beep and 1 short beep = Memory error
1 long beep and 2 short beeps = Graphic card error
1 long beep and 3 short beeps = AGP error
1 long beep and 9 short beeps = Memory Error
Continuous long beep = Memory not correctly installed
Continuous short beep = Power supply unit failed

AMI BIOS
1 short beep = Memory Error
2 short beeps = Memory parity check error
3 short beeps = basic memory 64K address check error
4 short beeps = Real Time Clock malfunction
5 short beeps = CPU error
6 short beeps = Keyboard error
7 short beeps = CPU interruption error
8 short beeps = Graphic card error
9 short beeps = Memory error
10 short beeps = CMOS error
11 short beeps = CPU cache memory malfunction

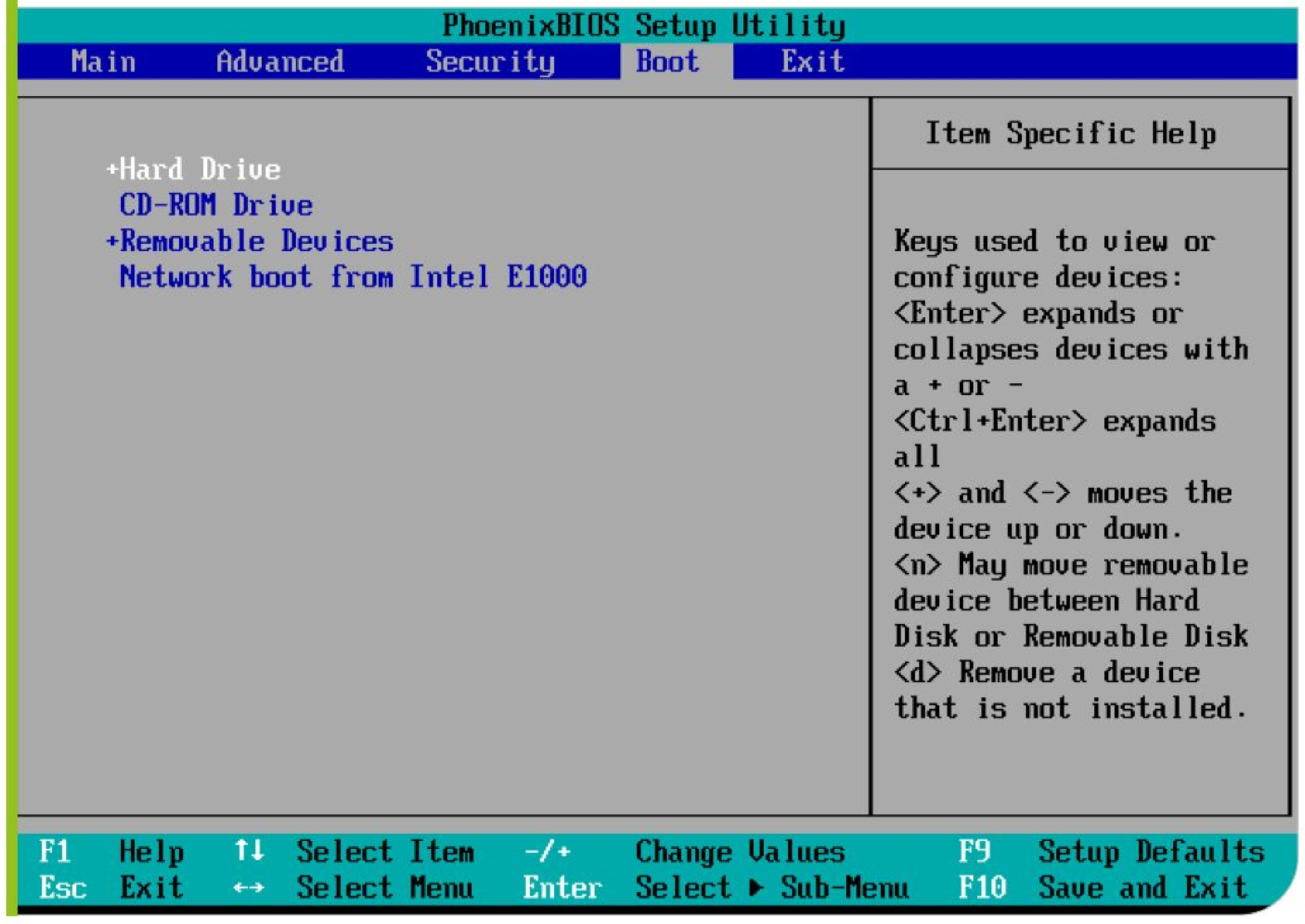
SAPPHIRE
G1
Thermaltake

Boot Problems

Hopefully hardware errors have been avoided or fixed using the tips above but what about the next stage of testing out your new build, the boot sequence. Here are some of the most common problems you may encounter when booting a new build PC for the first time.

CAN'T FIND BOOT DISK

When this happens, you will see a message indicating an unformatted disk or that the operating system can't be found. In a new system, this often means you have got the wrong boot device specified in the system BIOS. For example, if you need to boot from the optical drive to install the OS, you will need to set the optical drive as the first boot device. Some newer boards with both IDE connectors and SATA connectors will treat them differently.



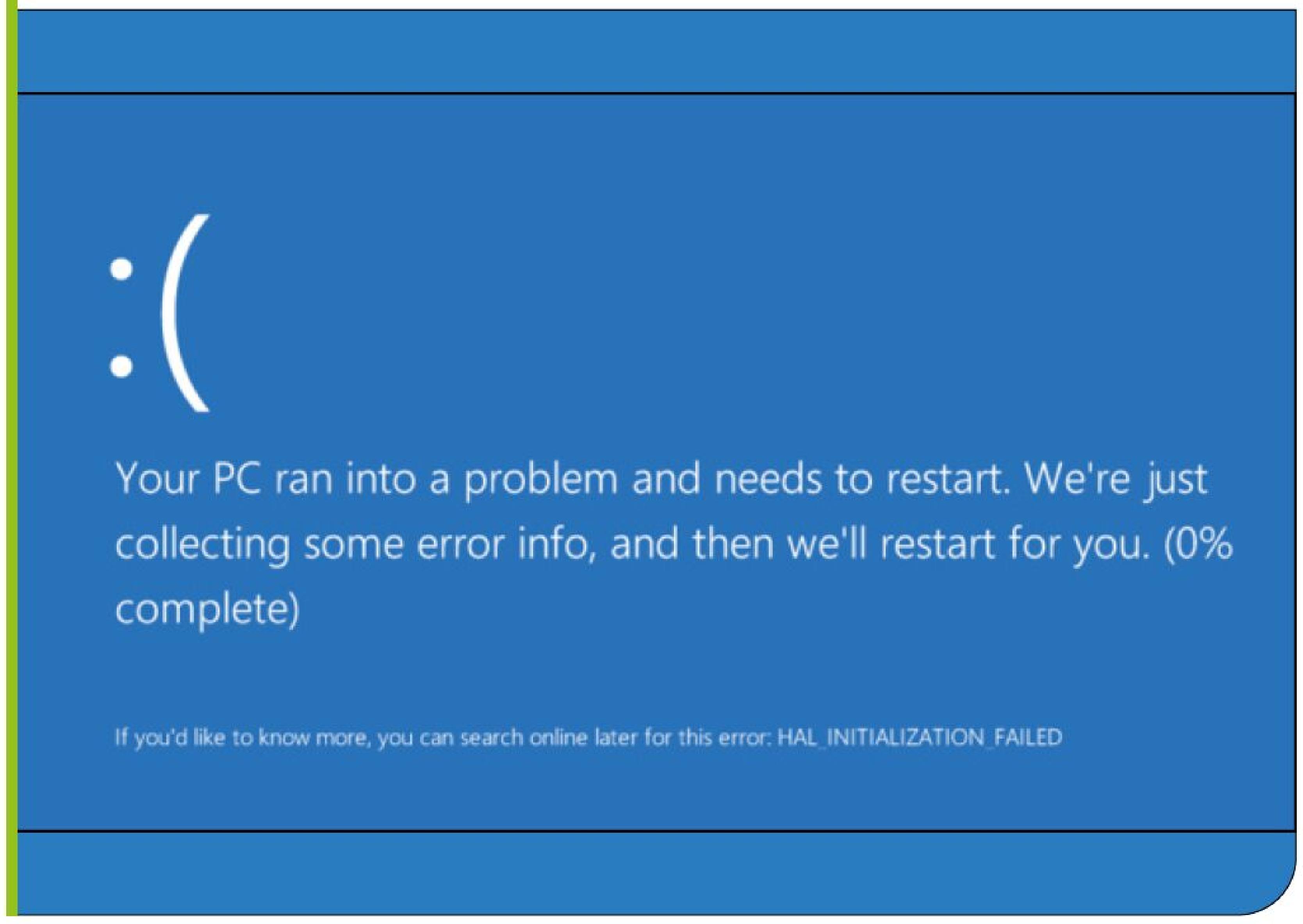
```
                         PhoenixBIOS Setup Utility
   Main      Advanced      Security      Boot      Exit

                                              Item Specific Help
      +Hard Drive
       CD-ROM Drive                         Keys used to view or
      +Removable Devices                    configure devices:
       Network boot from Intel E1000        <Enter> expands or
                                            collapses devices with
                                            a + or -
                                            <Ctrl+Enter> expands
                                            all
                                            <+> and <-> moves the
                                            device up or down.
                                            <n> May move removable
                                            device between Hard
                                            Disk or Removable Disk
                                            <d> Remove a device
                                            that is not installed.

F1  Help  ↑↓ Select Item  -/+    Change Values       F9   Setup Defaults
Esc Exit  ↔  Select Menu  Enter  Select ▸ Sub-Menu   F10  Save and Exit
```

MULTIPLE HARD DRIVES

If there are multiple hard drives, make sure the hard drive order is set correctly because specifying "hard drive" as the boot device only means that the system will attempt to boot from the first hard drive.

BLUE SCREEN

If you are trying to boot from an existing Windows installation on a hard drive transferred from an older system, then a BSOD on startup can occur. The specific error code is 0x0000007. This often means that the system cannot find the right storage controller. Maybe your old system had its SATA ports set to IDE mode and your new one is set up for AHCI or perhaps your new board has a different chipset.



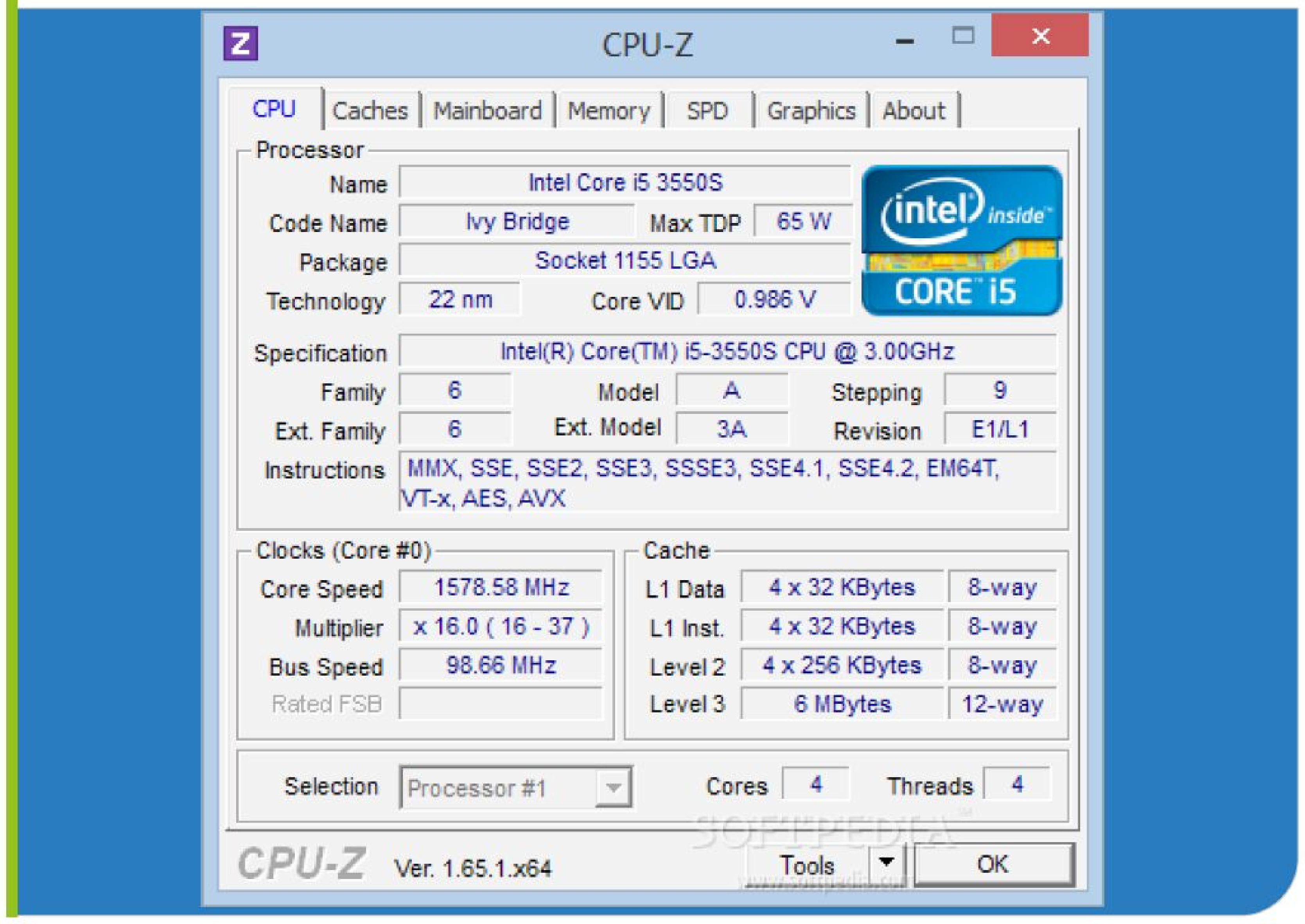
:(

Your PC ran into a problem and needs to restart. We're just collecting some error info, and then we'll restart for you. (0% complete)

If you'd like to know more, you can search online later for this error: HAL_INITIALIZATION_FAILED

WINDOWS INSTALL FAULT

If, during the installation of Windows, the process abruptly aborts for no apparent reason, you may have bad or overclocked memory. The Windows boot CD ships with a memory diagnostic. Just boot from the DVD and run the diagnostic, which should tell you if memory is the culprit. You will be prompted to either load Windows, which is Windows set up, or the memory diagnostic.



Processor

Name: Intel Core i5 3550S
Code Name: Ivy Bridge
Max TDP: 65 W
Package: Socket 1155 LGA
Technology: 22 nm
Core VID: 0.986 V
Specification: Intel(R) Core(TM) i5-3550S CPU @ 3.00GHz
Family: 6
Model: A
Stepping: 9
Ext. Family: 6
Ext. Model: 3A
Revision: E1/L1
Instructions: MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, EM64T, VT-x, AES, AVX

Clocks (Core #0)

Core Speed: 1578.58 MHz
Multiplier: x 16.0 (16 - 37)
Bus Speed: 98.66 MHz
Rated FSB:

Cache

L1 Data	4 x 32 KBytes	8-way
L1 Inst.	4 x 32 KBytes	8-way
Level 2	4 x 256 KBytes	8-way
Level 3	6 MBytes	12-way

Selection: Processor #1
Cores: 4
Threads: 4

CPU-Z Ver. 1.65.1.x64

SOFTPEDIA

Installing Software

Learn more about the vital main software you will need on your new PC. We cover installing an operating system on both Windows and Linux, how to update preinstalled drivers as well as managing and maintaining your PC once the initial set up is complete. We have even included a handy guide to some essential post-build programs and apps.

Installing Software

CONTENTS

94 Installing the Windows OS

96 Upgrading to Windows 10 from Windows 7 or 8.1

100 Updating Your Motherboard BIOS

104 Updating Your Device Drivers

106 Optimising Your PC for Performance

108 Protecting Your PC from Malware

110 Upgrading to a Solid State Drive (SSD)

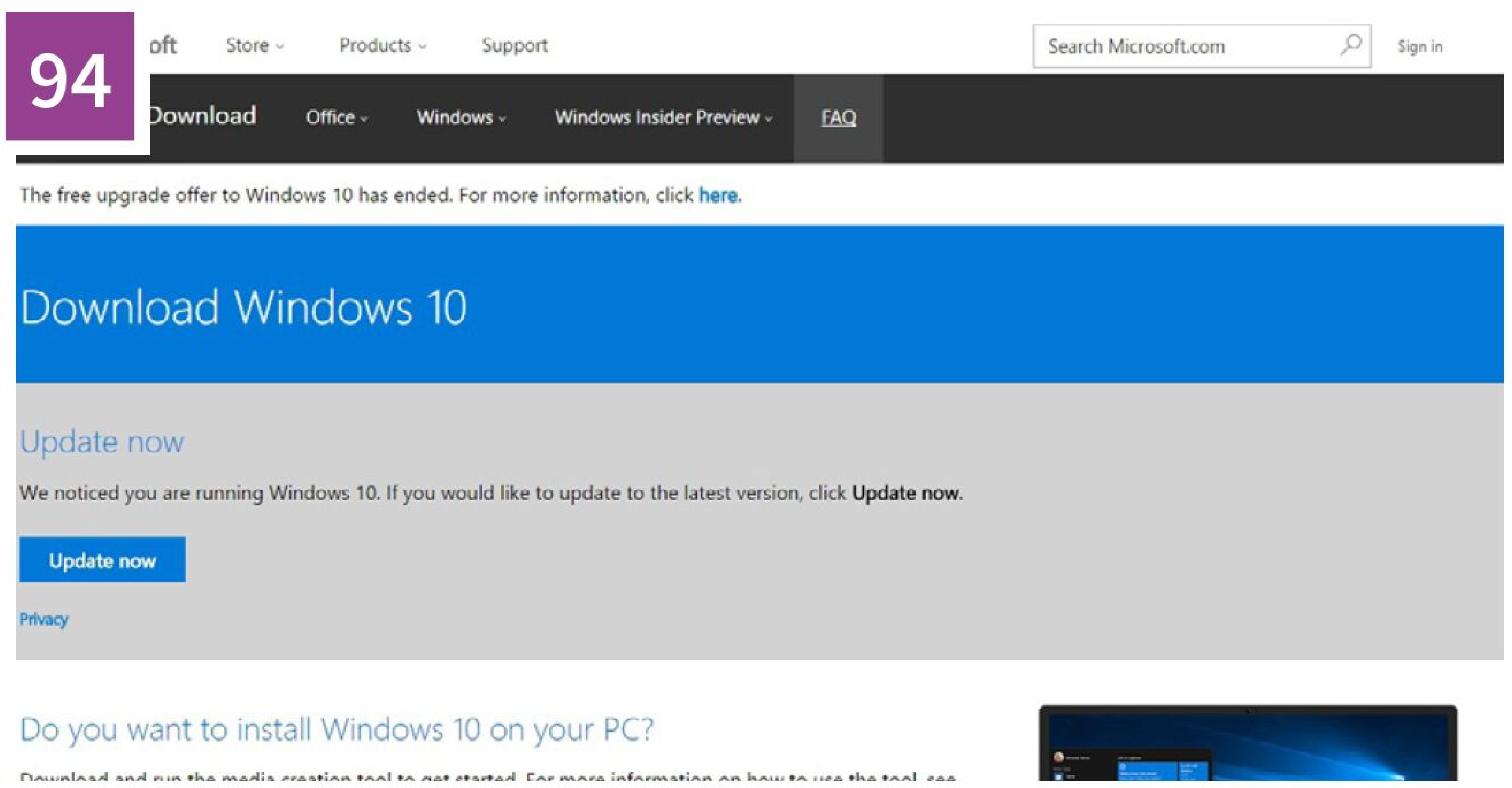
114 Migrating Windows 10 to a New SSD

118 Choosing Linux

120 Installing Linux on a PC

122 20 Essential Apps

94



oft
Store
Products
Support
Search Microsoft.com
Sign in
Download
Office
Windows
Windows Insider Preview
FAQ

The free upgrade offer to Windows 10 has ended. For more information, click here.

Download Windows 10

Update now

We noticed you are running Windows 10. If you would like to update to the latest version, click **Update now**.

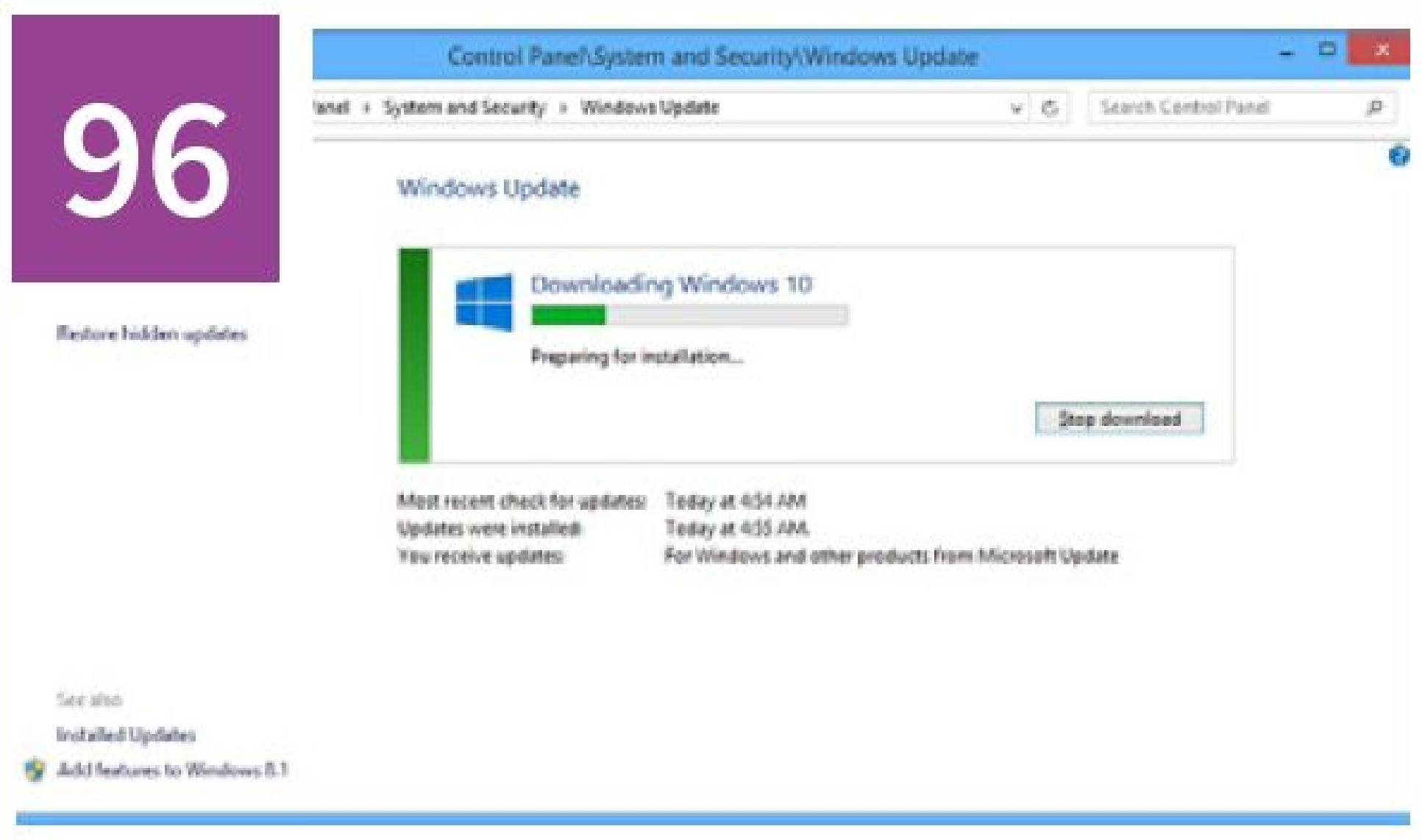
Update now
Privacy

Do you want to install Windows 10 on your PC?

INSTALLING WINDOWS

Learn how to install the Windows operating system on a brand new computer, no matter whether you have an existing copy on CD or if you are downloading online and installing from a USB flash drive. You will also learn how to manage the initial boot process to allow your PC to read from a variety of sources.

96


Control Panel\System and Security\Windows Update

anel › System and Security › Windows Update
Search Control Panel
Windows Update
Restore hidden updates

Downloading Windows 10

Preparing for installation...

Stop download

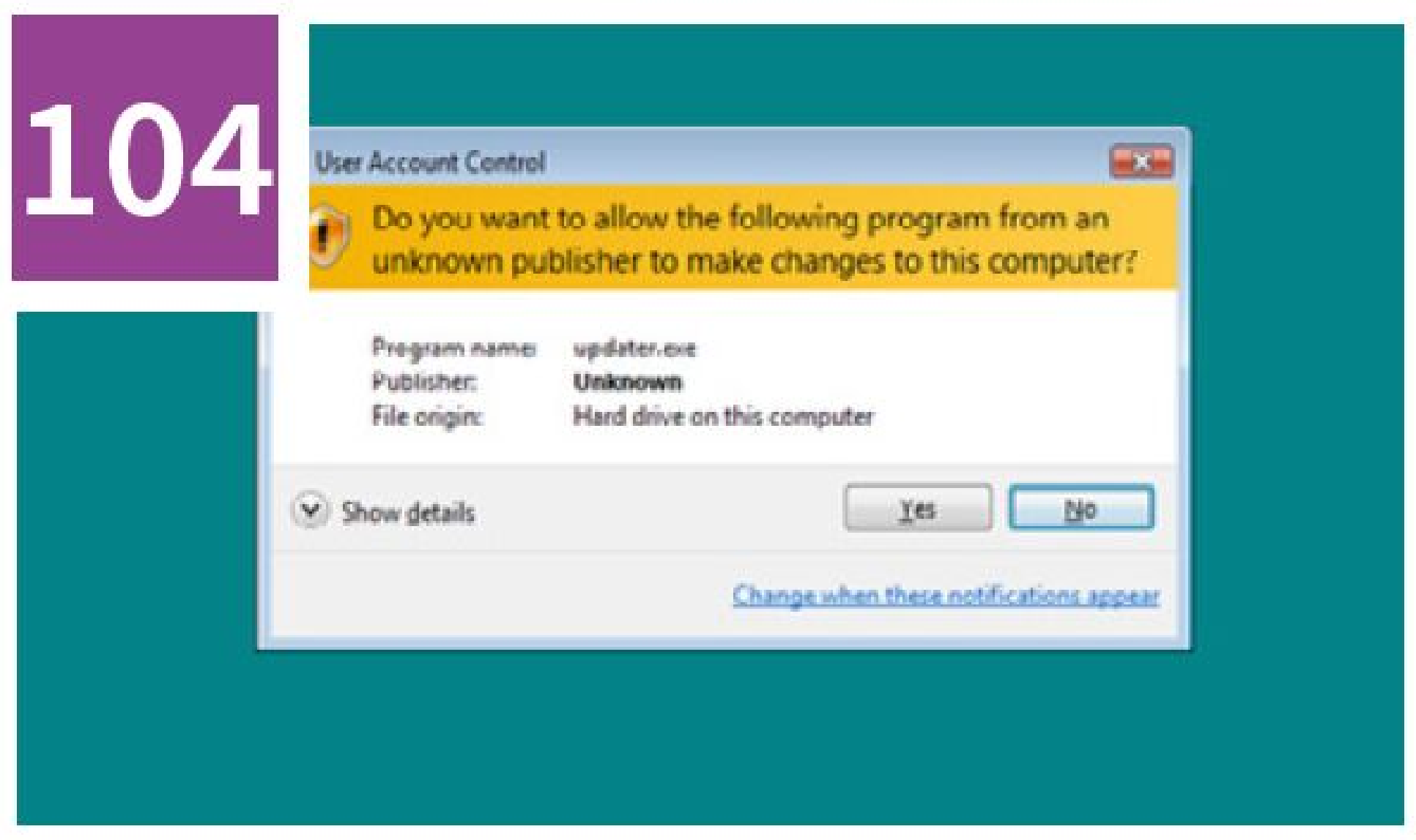
Most recent check for updates: Today at 4:54 AM
Updates were installed: Today at 4:55 AM
You receive updates: For Windows and other products from Microsoft Update

See also
Installed Updates
Add features to Windows 8.1

UPGRADING TO WINDOWS 10

Installing Windows 10 on a PC running 7 or 8.1 is a relatively simple process, as long as you follow these steps.

104


User Account Control

Do you want to allow the following program from an unknown publisher to make changes to this computer?

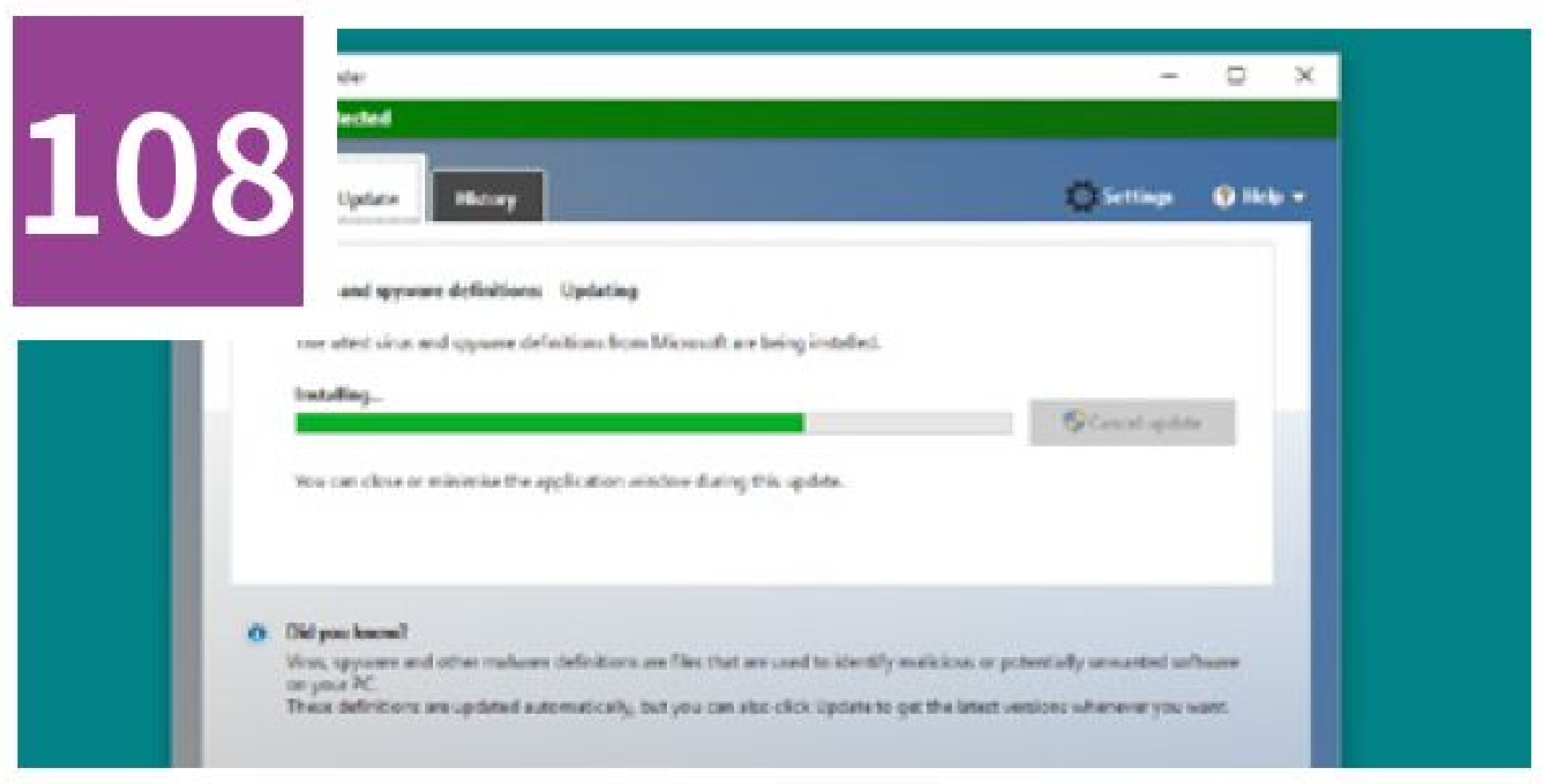
Program name: updater.exe
Publisher: **Unknown**
File origin: Hard drive on this computer

Show details
Yes
No
Change when these notifications appear

UPDATE YOUR DEVICE DRIVERS

Windows 10 comes with default drivers, but for optimum performance it's a good idea to download the latest.

108



PROTECT YOUR PC FROM MALWARE

Learn how to use key apps and software to protect your brand new computer from viruses and malware threats.

110

SanDisk
SSD PLUS
Solid State Drive

UPGRADE TO A SOLID STATE DRIVE

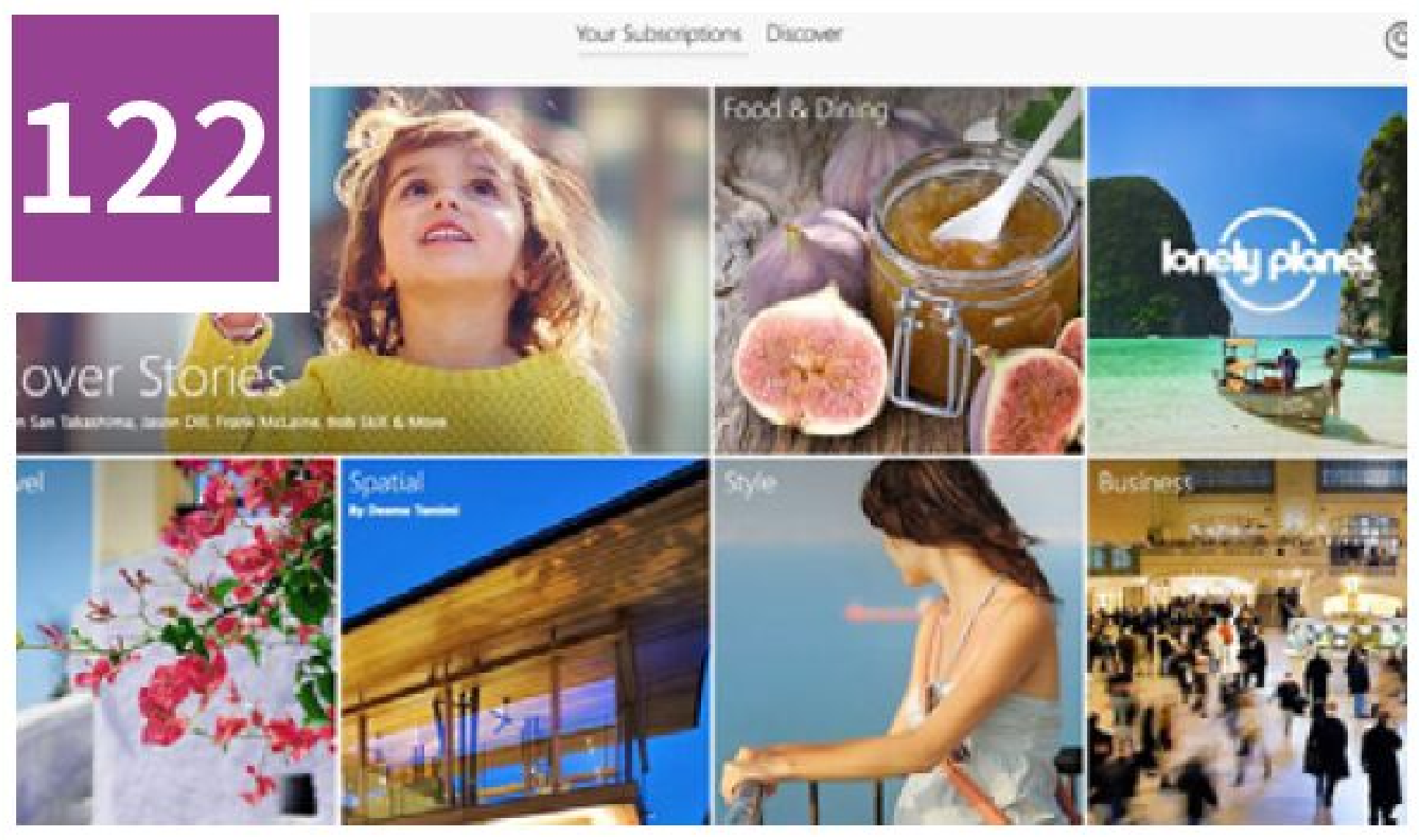
SSDs have much faster read and write times than disk drives, which means that Windows will launch and run faster.

118

CHOOSING LINUX

Installing an unfamiliar Linux distribution on your new PC is certainly not something everyone will want to do.

122



Your Subscriptions
Discover
over Stories
Food & Dining
lonely planet
Spatial
Style
Business

20 ESSENTIAL FIRST APPS

Take a look at some of the best, most useful and most unique apps available to download right now.

Installing the Windows OS

Installing the Windows OS, be it 7, 8 or 10, on a brand new PC is not quite as simple as booting up, putting in the installation disc and following the on-screen instructions. But don't worry, once you know the fairly easy steps you need to take, getting the operating system onto your new PC should be a straightforward process. This is also a good time to get used to working in the BIOS menu.

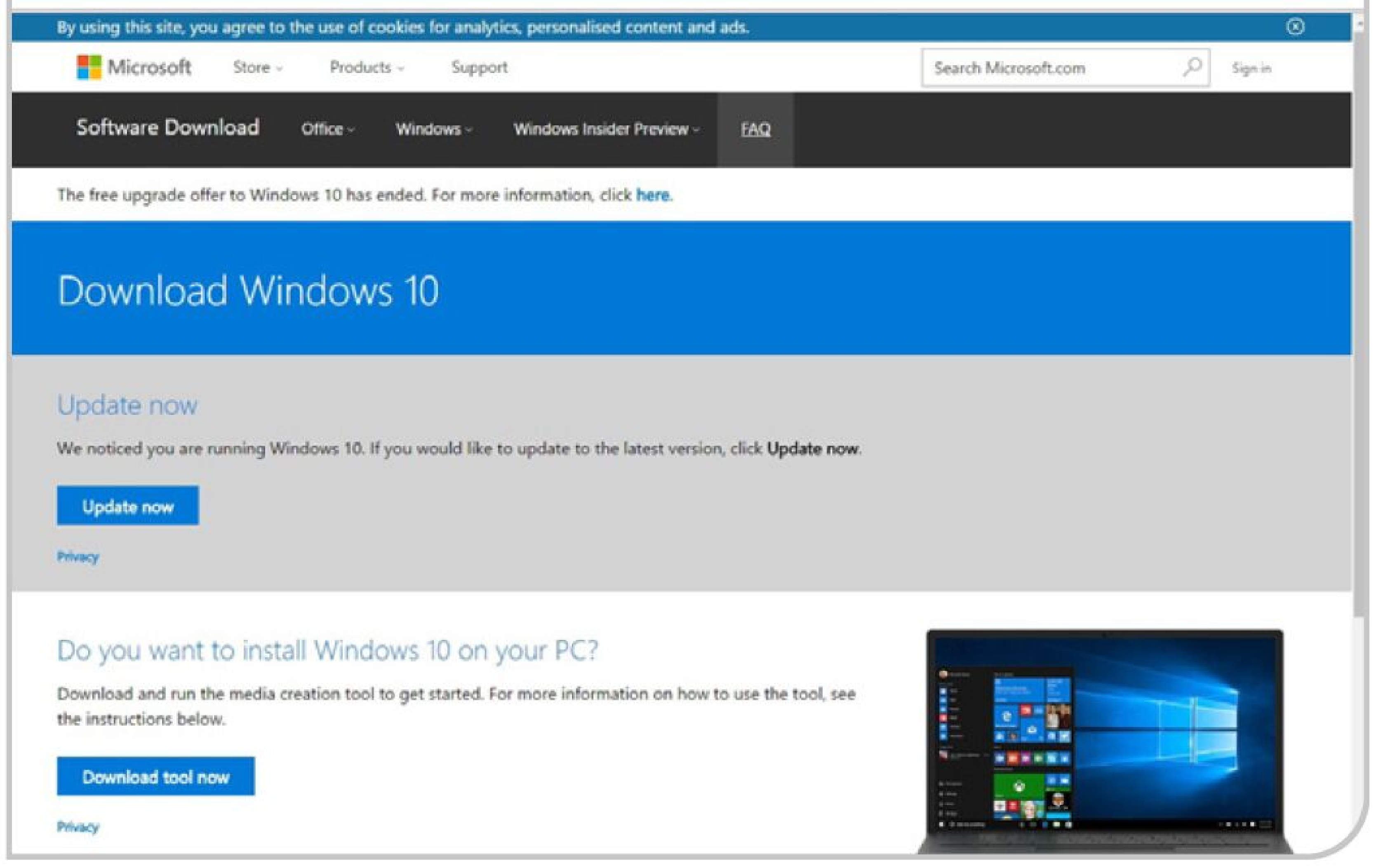
The Installation Media

The first thing to consider is the installation media you want to use to install Windows. This can be either a shop-bought install disc, a created disc or a prepared USB flash drive.

STEP 1 If you have a official Windows installation disc, you can skip this part and move on to the boot process. If you have an old copy of windows, it is usually possible to reuse that to install windows on your new PC, as long as it is not already registered on another PC (or is no longer being used on another PC, although this is a slightly more complicated process).

Do not lend or make illegal copies.
DVD
ROM
Microsoft
32-bit (x86) Edition
© 2009 Microsoft Corporation
Part No. CLC-0182
Not for resale
Windows® 7
Ultimate

STEP 2 Increasingly, Windows is offered as a downloadable file rather than a physical disc. Just as with a disc, when buying a digital copy of Windows, it will need to include a unique activation key. You will be asked for this during installation. A digital download of Windows will be an ISO file, which is just a archive of a CD/DVD (called an Image). This will need to be burnt to a disc or to a bootable USB flash drive.


Microsoft
Store
Products
Support
Search Microsoft.com
Sign in
Software Download
Office
Windows
Windows Insider Preview
FAQ
Update now
Privacy
Download tool now
Privacy

By using this site, you agree to the use of cookies for analytics, personalised content and ads.

The free upgrade offer to Windows 10 has ended. For more information, click **here**.

Download Windows 10

Update now

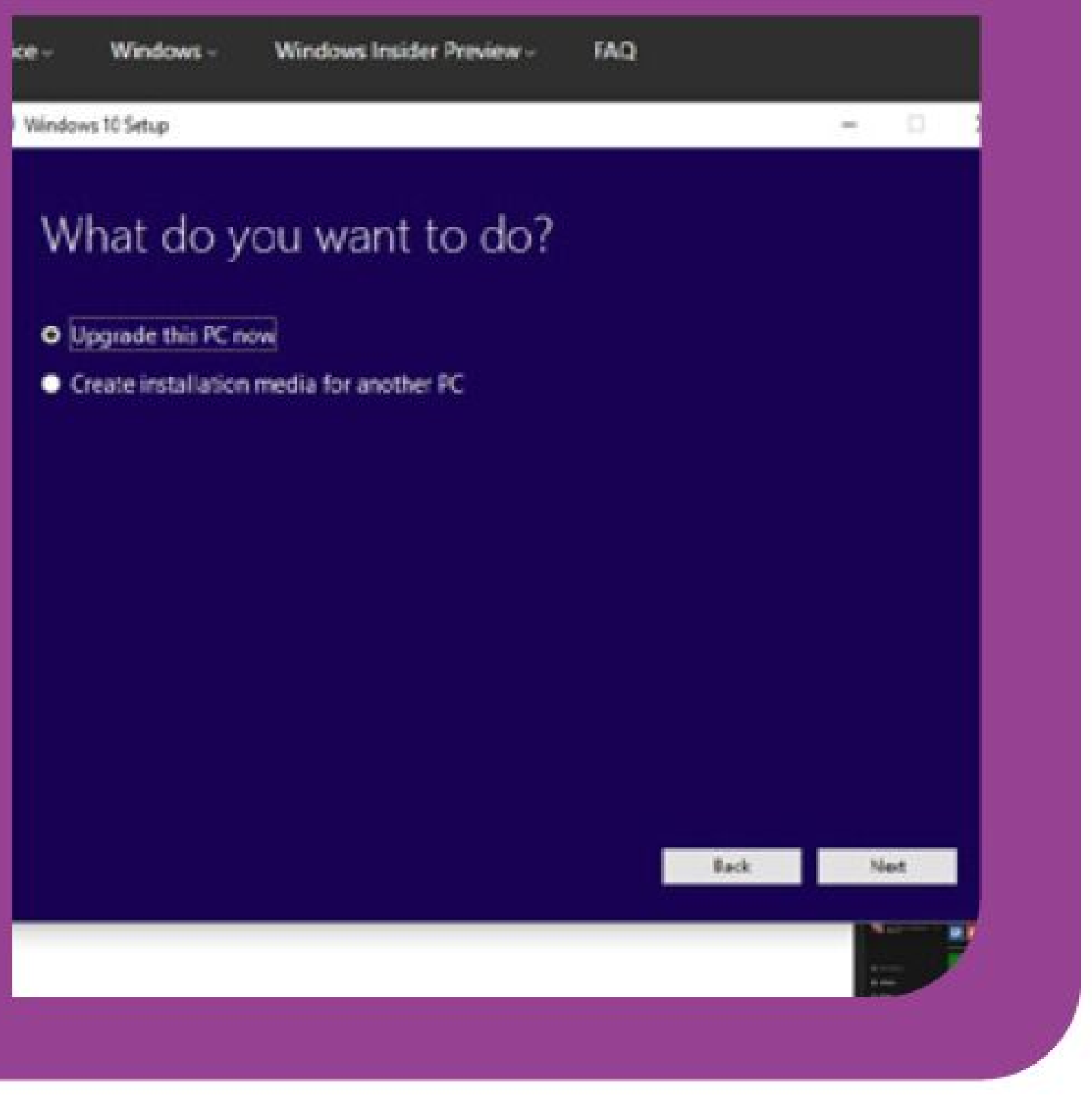
We noticed you are running Windows 10. If you would like to update to the latest version, click **Update now**.

Do you want to install Windows 10 on your PC?

Download and run the media creation tool to get started. For more information on how to use the tool, see the instructions below.

MEDIA CREATION TOOL

Download the Windows Media Creation Tool from the Microsoft website, and run it. Select Create installation media for another PC. Select the language, edition and architecture (64-bit or 32-bit) for Windows. Choose the installation media (DVD or USB), click Next and then select Finish when it's done.


Windows
Windows Insider Preview
FAQ
Windows 10 Setup
Back
Next

What do you want to do?

○ Upgrade this PC now

● Create installation media for another PC

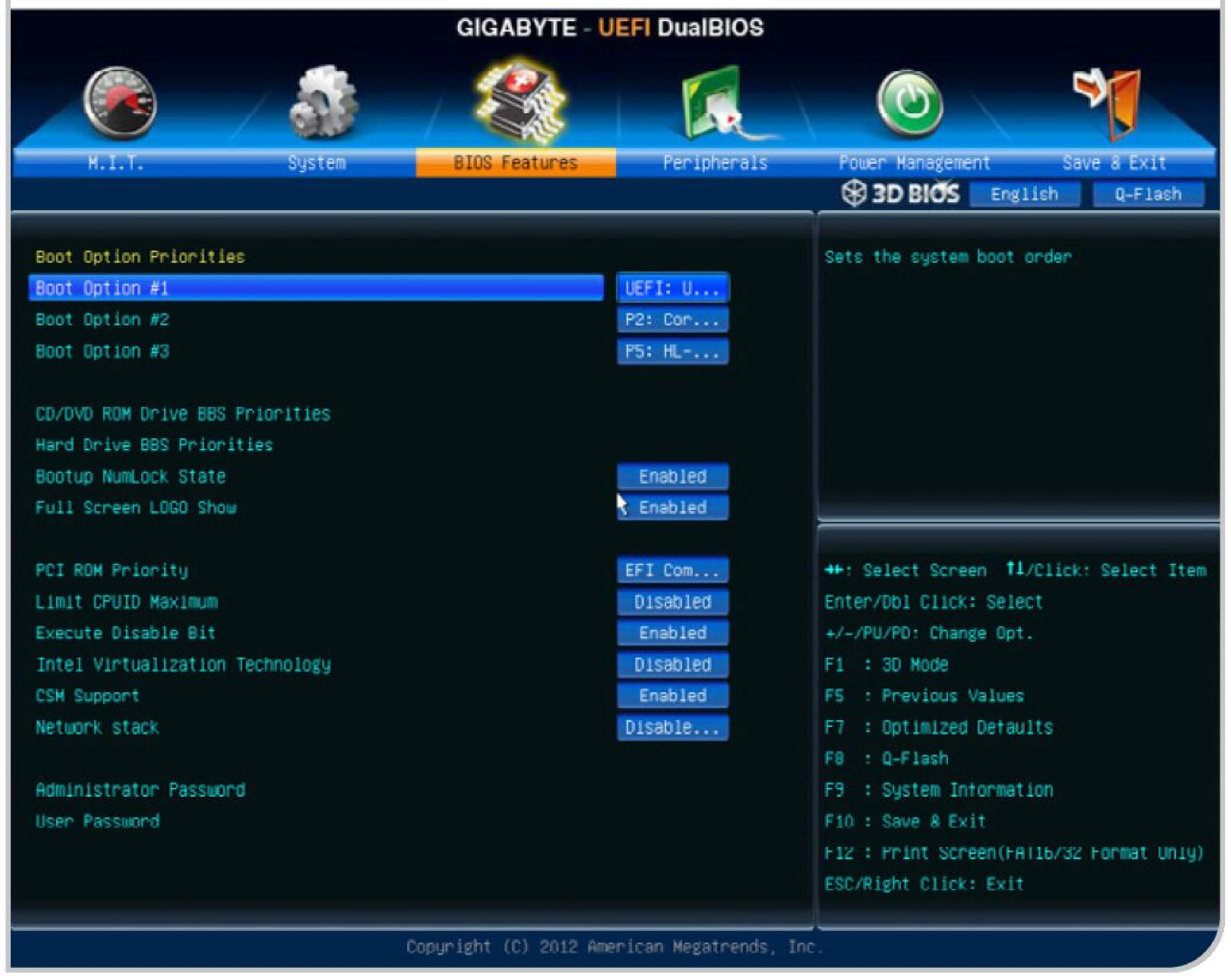
READY TO INSTALL

You now have everything you need to install a fresh copy of windows on a new PC: Original installation disc or created install media, an activation key and your blank PC. So now we need to take a look at how we get a PC with nothing on it to read a DVD or USB we have inserted.

The Boot Process

The BIOS is pre-installed on your motherboard, and controls all the aspects of how your PC boots up, as well as many other things. It also allows you to manage the boot order.

STEP 1 If you have never done it before (and many people won't have) changing things in a BIOS menu can seem daunting. But all we are doing here is changing the boot order, so the first thing the PC encounters is your disc or USB drive with the Windows ISO on it. It can then boot from the disc, prompting it to install Windows.

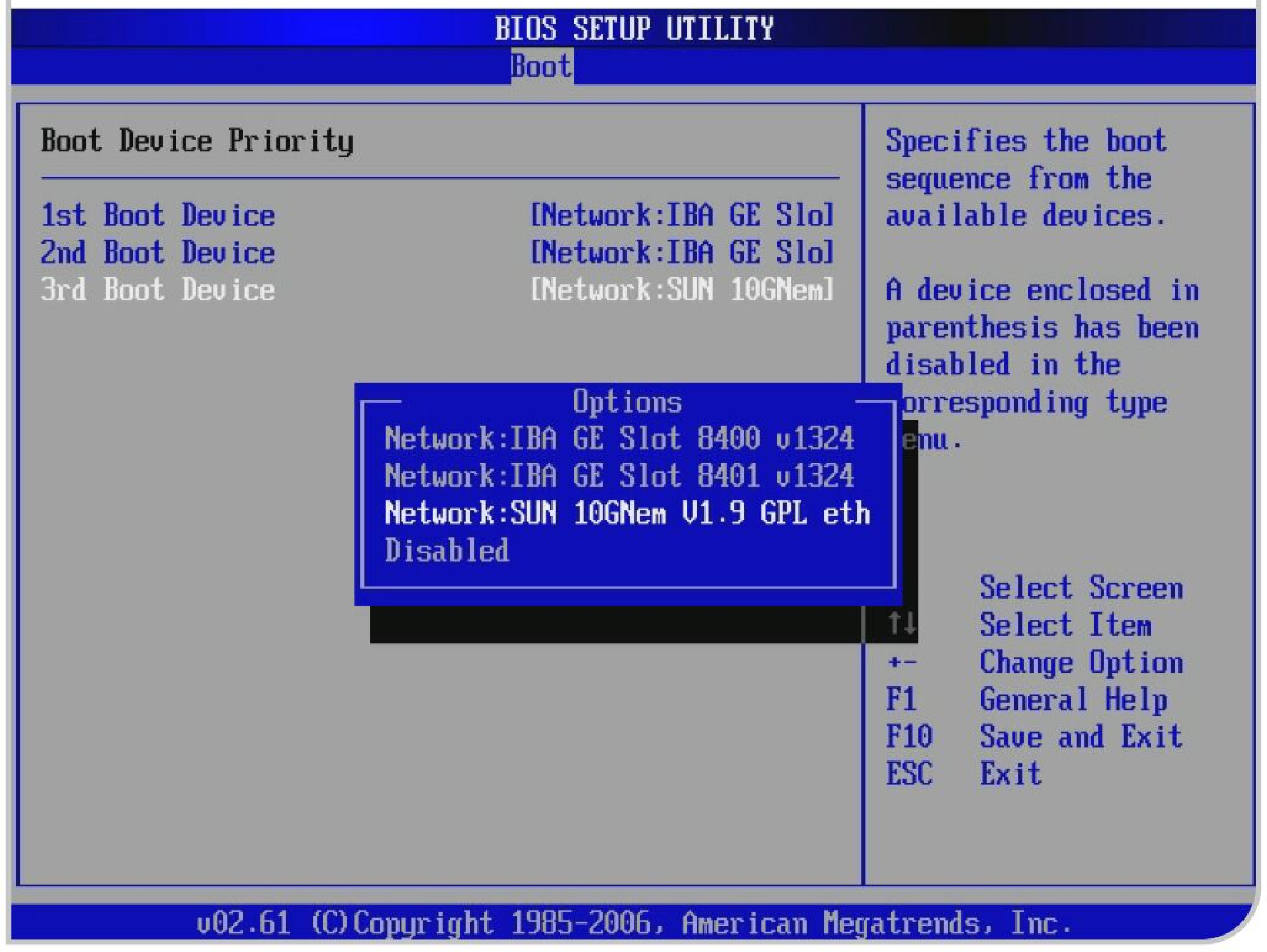


```
Boot Option Priorities                          Sets the system boot order
Boot Option #1                     UEFI: U...
Boot Option #2                     P2: Cor...
Boot Option #3                     P5: HL-...

CD/DVD ROM Drive BBS Priorities
Hard Drive BBS Priorities
Bootup NumLock State               Enabled
Full Screen LOGO Show              Enabled

PCI ROM Priority                   EFI Com...   ←→: Select Screen  ↑↓/Click: Select Item
Limit CPUID Maximum                Disabled     Enter/Dbl Click: Select
Execute Disable Bit                Enabled      +/-/PU/PD: Change Opt.
Intel Virtualization Technology    Disabled     F1  : 3D Mode
CSM Support                        Enabled      F5  : Previous Values
Network stack                      Disable...   F7  : Optimized Defaults
                                                F8  : Q-Flash
Administrator Password                          F9  : System Information
User Password                                   F10 : Save & Exit
                                                F12 : Print Screen(FAT16/32 Format Only)
                                                ESC/Right Click: Exit

             Copyright (C) 2012 American Megatrends, Inc.
```

STEP 2 BIOS (Basic Input Output Subsystem) is a programmable chip that controls how information is passed to various devices in the computer system. A typical method to access the BIOS settings screen is to press ESC, F1, F2, F8 or F10 during the boot sequence. Power your PC up, insert your bootable disc or USB, restart and press the relevant keyboard key until the BIOS menu opens.

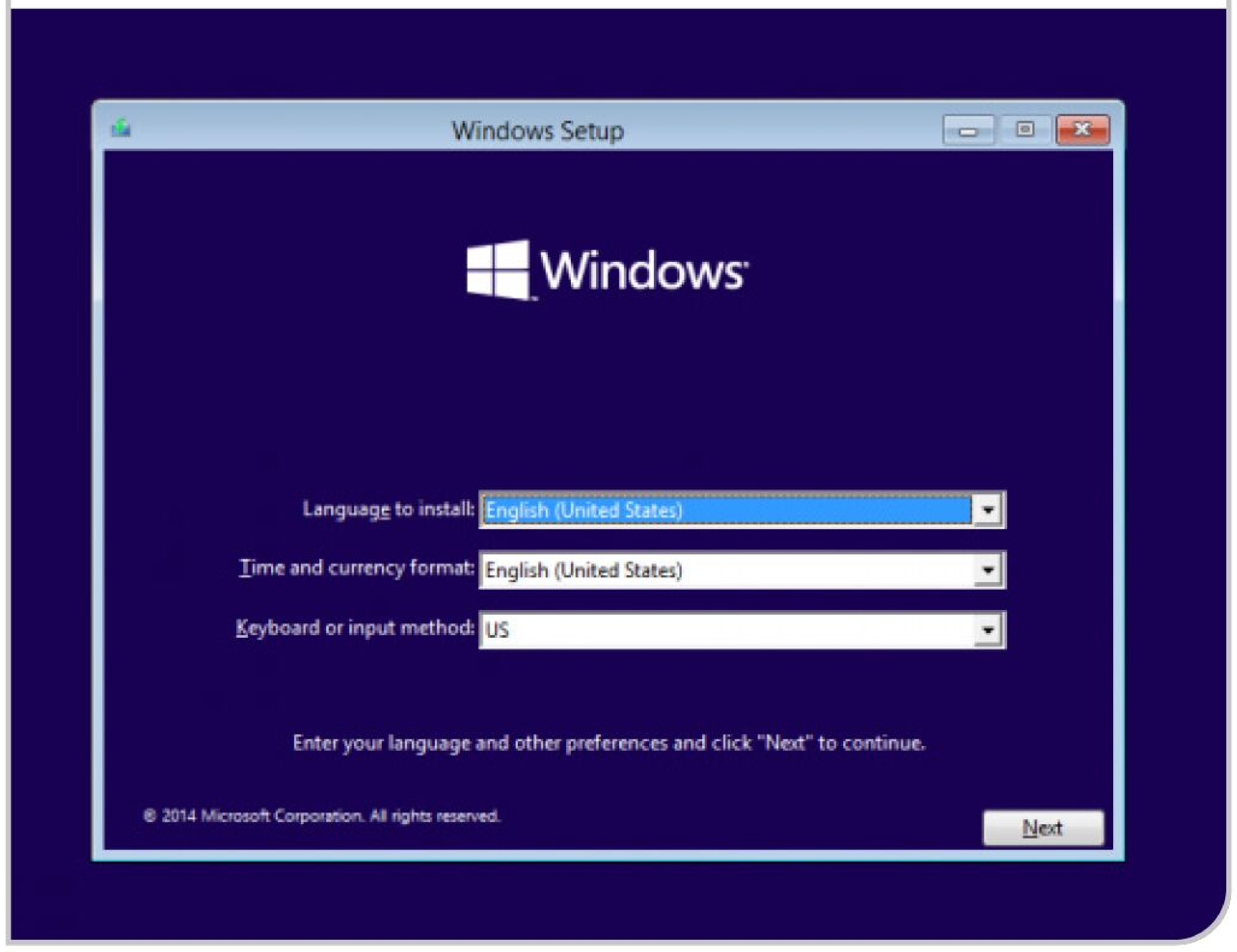
F8
F9
F10
F11
F12
Game
Print Screen
Sys Rq
Scroll Lock
8 KEY
Ins
Hom

STEP 3 Use the arrow keys to select the BOOT tab. System devices appear in order of priority. BIOS settings allow you to run a boot sequence from a floppy drive, a hard drive, a CD-ROM drive or an external device. You may configure the order that your computer searches these physical devices for the boot sequence. The first device in the order list has the first boot priority.



```
                         BIOS SETUP UTILITY
                                Boot
Boot Device Priority                                 Specifies the boot
                                                     sequence from the
1st Boot Device        [Network:IBA GE Slo]          available devices.
2nd Boot Device        [Network:IBA GE Slo]
3rd Boot Device        [Network:SUN 10GNem]          A device enclosed in
                                                     parenthesis has been
                                                     disabled in the
                  Options                            orresponding type
   Network:IBA GE Slot 8400 v1324                    enu.
   Network:IBA GE Slot 8401 v1324
   Network:SUN 10GNem V1.9 GPL eth
   Disabled
                                                          Select Screen
                                                     ↑↓   Select Item
                                                     +-   Change Option
                                                     F1   General Help
                                                     F10  Save and Exit
                                                     ESC  Exit
      v02.61 (C)Copyright 1985-2006, American Megatrends, Inc.
```

STEP 4 Save and exit the BIOS setup utility and the computer will restart with the changed settings. Windows installation should now begin. Because you are using a brand new hard drive, you will need to choose where to install Windows (main drive area, or create a partition). In our experience, there is little need to create a separate partition for Windows these days.



Language to install: English (United States)

Time and currency format: English (United States)

Keyboard or input method: US

Enter your language and other preferences and click "Next" to continue.

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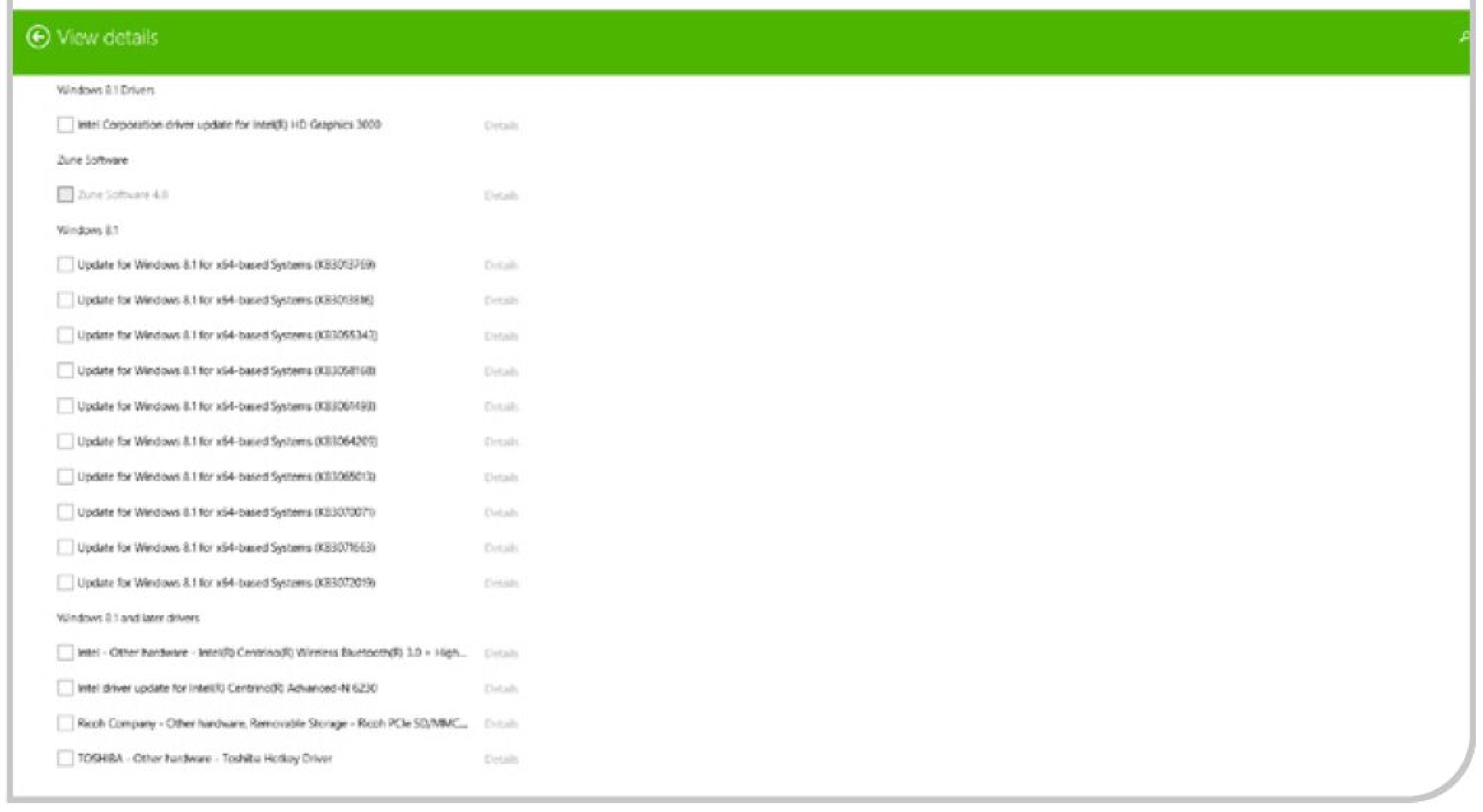
Upgrading to Windows 10 from Windows 7 or 8.1

If you have an existing copy of Windows 7 or 8.1 on disc, not being used on another active PC, you can use this for the initial install of Windows and then upgrade to Windows 10 afterwards or at a later date. You have missed the deadline for the free upgrade to 10 but it is quite likely that Microsoft will reopen that offer, or run similar discounted offers, for their new OS in the near future. This guide assumes you are taking this route to Windows 10, rather than a fresh install.

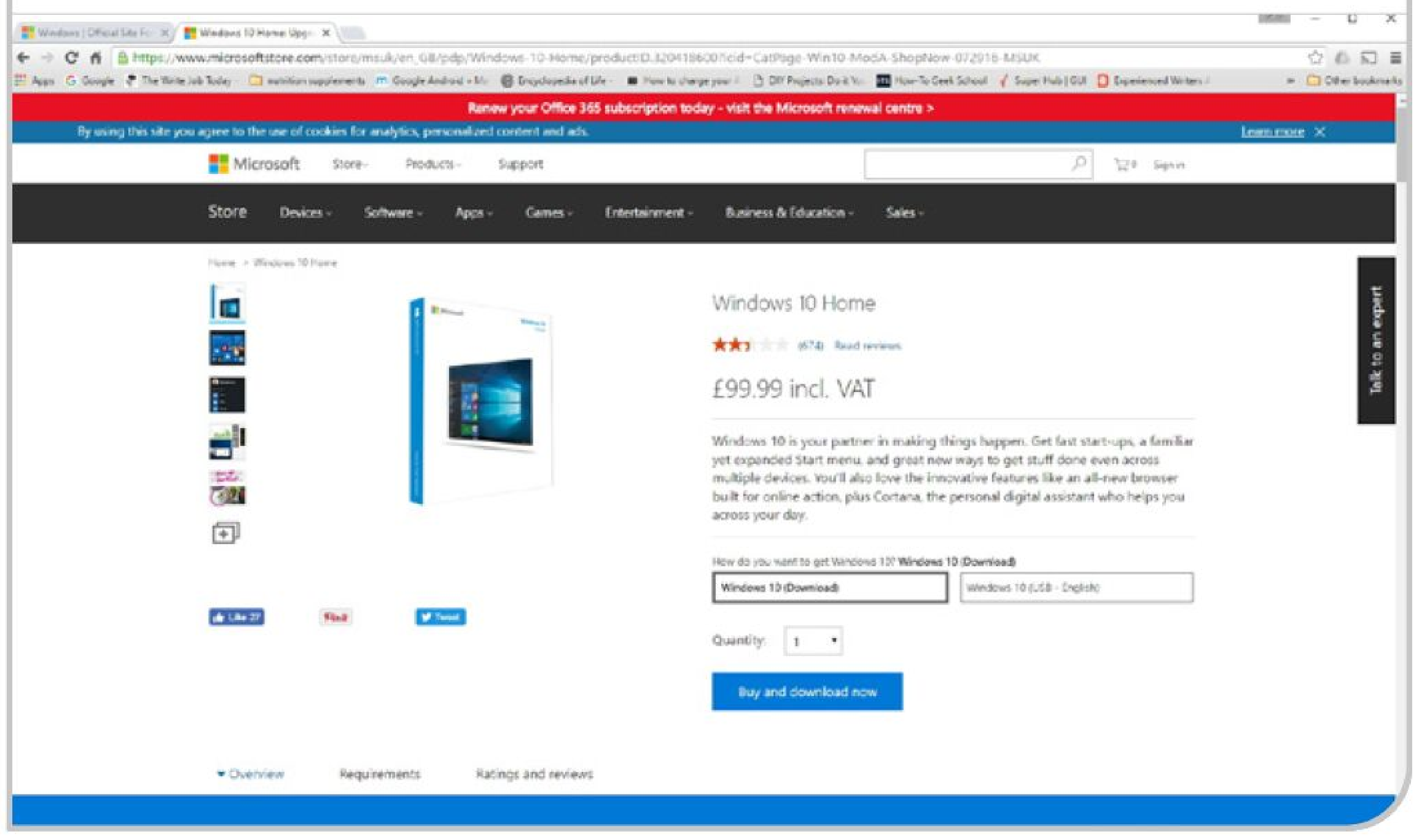
Upgrading to Windows 10

Installing Windows 10 on a PC running Windows 7 or 8.1 is a relatively simple process. However, because of the way Windows 8.1 works, it is quite a change and takes the desktop back to being far more like Windows 7.

STEP 1 The first thing you need to do is to make sure you have installed all of the updates for Windows 7 or Windows 8.1. This ensures that your PC is up-to-date and ready to receive the upgrade; update KB3035583 means that you'll receive the Get Windows 10 app and is where any future discounts will be offered.



STEP 2 You can also choose to download the Windows 10 update from Microsoft.com, save it to a disc or USB flash drive as an ISO, and install it from there. Follow the instructions on the website to learn how to create an ISO image of the OS, ready to be installed when you are ready.



Windows 10 Home

£99.99 incl. VAT

Windows 10 is your partner in making things happen. Get fast start-ups, a familiar yet expanded Start menu, and great new ways to get stuff done even across multiple devices. You'll also love the innovative features like an all-new browser built for online action, plus Cortana, the personal digital assistant who helps you across your day.

How do you want to get Windows 10? **Windows 10 (Download)**

Windows 10 (Download)

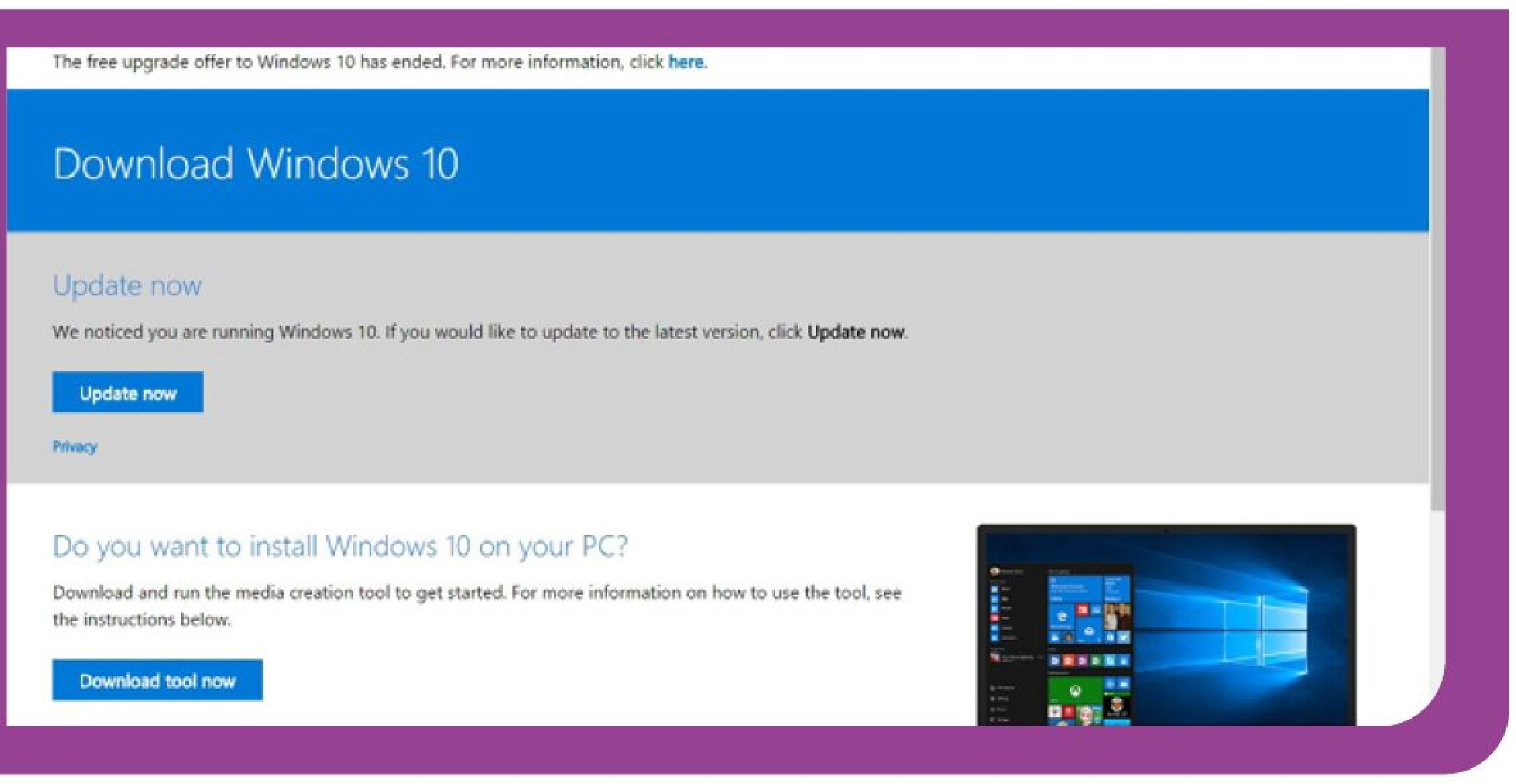
Windows 10 (USB - English)

Quantity: 1

Buy and download now

REINSTALLING WINDOWS 10

After you upgrade to Windows 10, you can reinstall or do a clean installation on the same device at any time in the future. You won't need a product key to reactivate Windows 10 on the same hardware, as it will already be tied to it. If you don't have a disc with the OS on, you can create installation media at https://www.microsoft.com/en-gb/software-download/windows10.



The free upgrade offer to Windows 10 has ended. For more information, click **here**.

Download Windows 10

Update now

We noticed you are running Windows 10. If you would like to update to the latest version, click **Update now**.

Update now

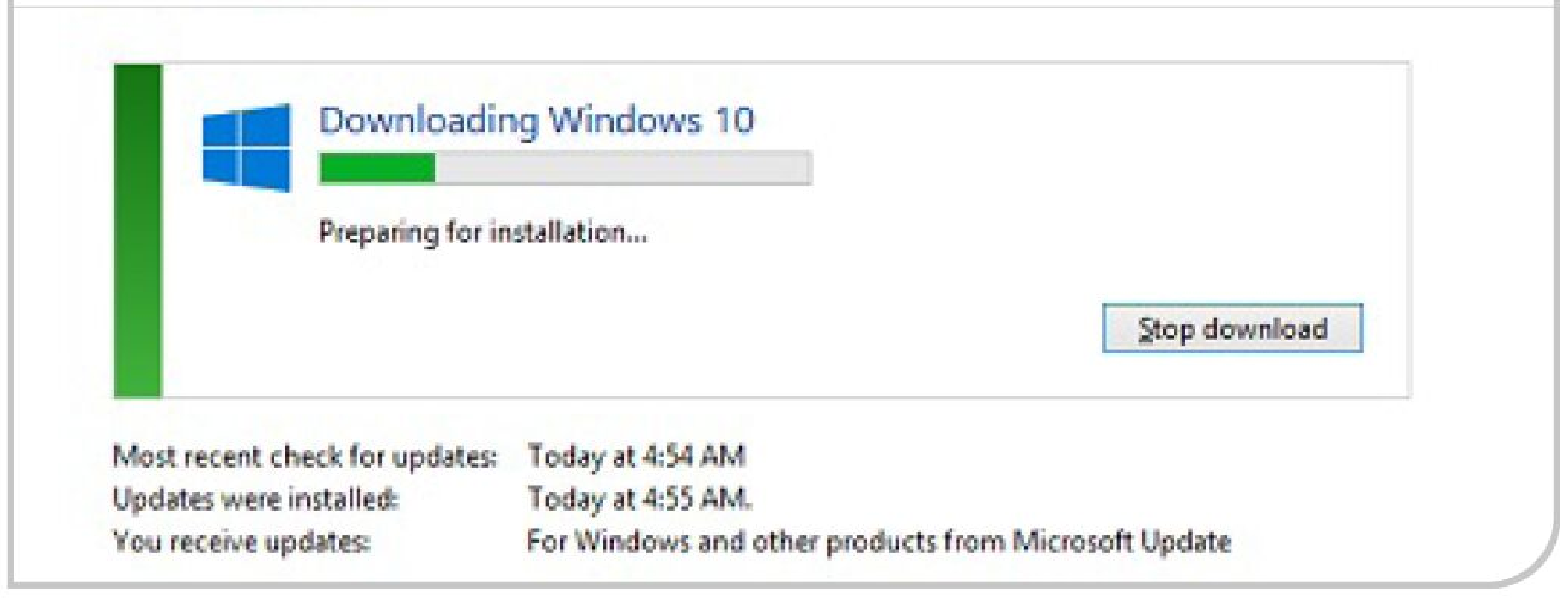
Privacy

Do you want to install Windows 10 on your PC?

Download and run the media creation tool to get started. For more information on how to use the tool, see the instructions below.

Download tool now

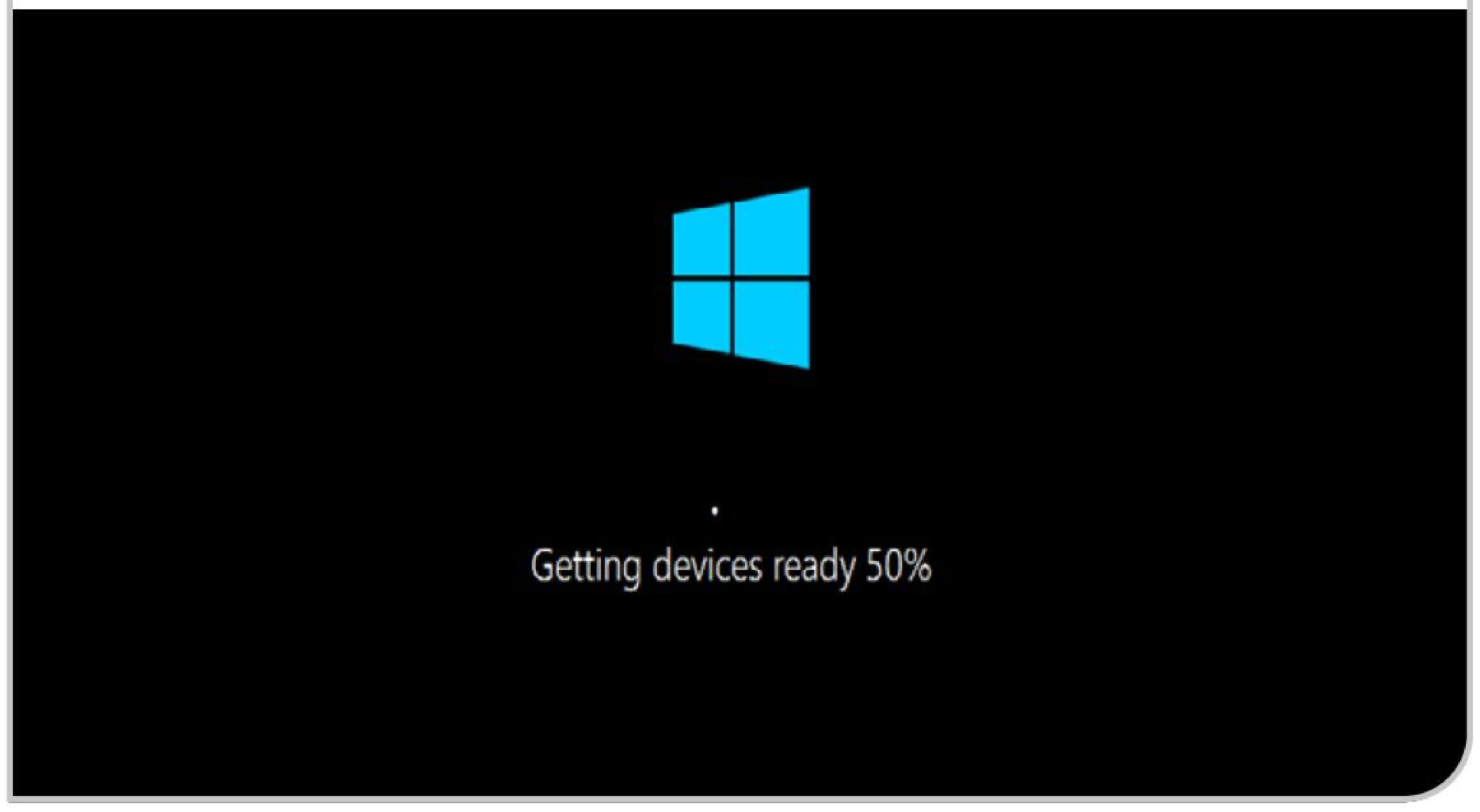
STEP 3 If you are downloading through the Get Windows 10 app, either as a free or discounted offer (remember, the initial free period has now finished, so you might have to pay full price), you will see instructions about what you need to do. The download is fairly fast if you have a good broadband connection.


Downloading Windows 10

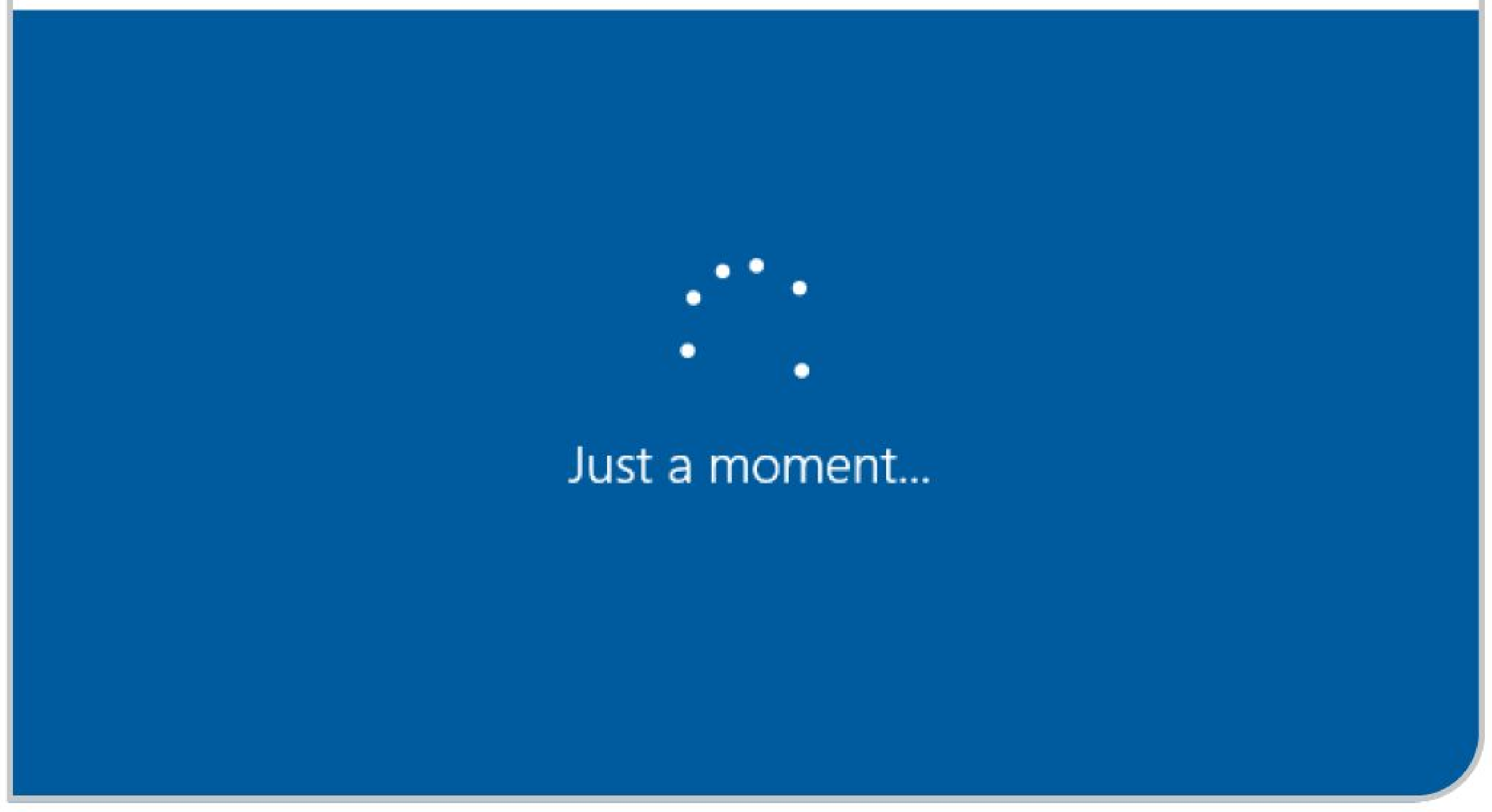
Preparing for installation...

Most recent check for updates: Today at 4:54 AM
Updates were installed: Today at 4:55 AM.
You receive updates: For Windows and other products from Microsoft Update

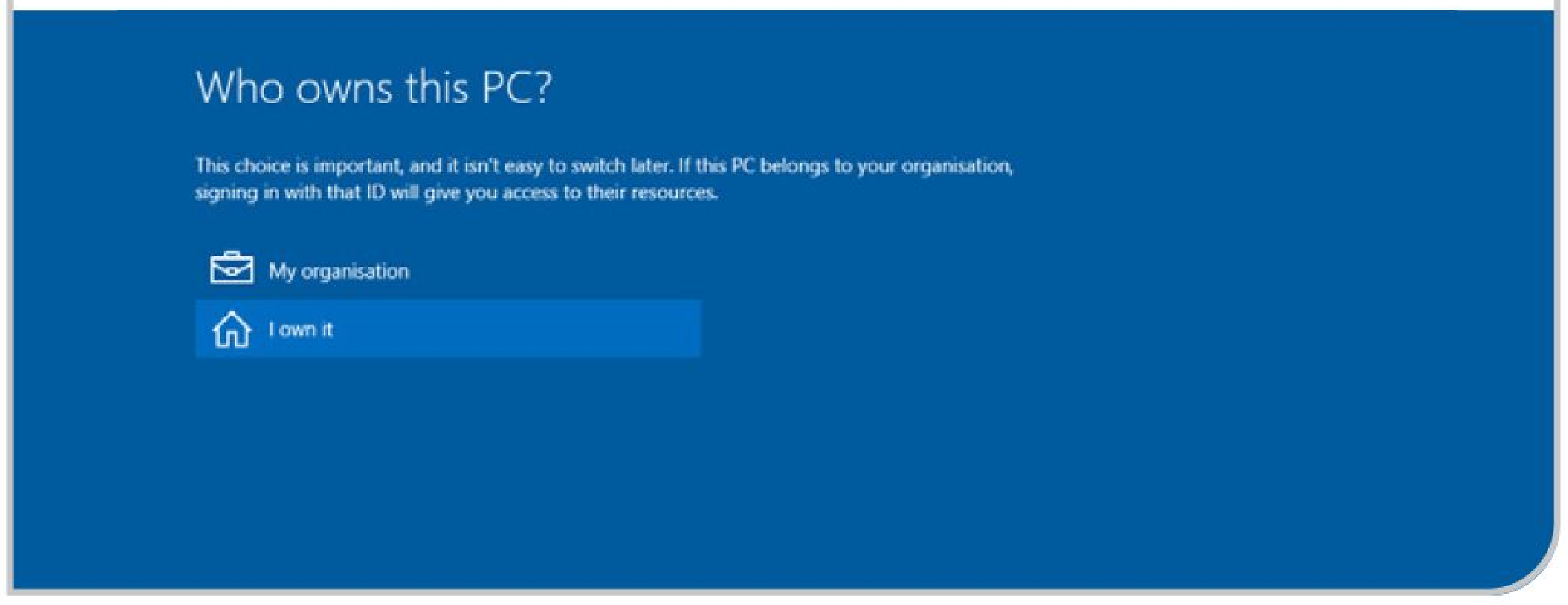
STEP 4 Once it's downloaded, you'll be asked to restart your PC and begin the installation. Your PC will run through several processes during this time, including checking that everything installed and connected to your PC is OK with the update. The Windows 10 installation can vary in how long it will take depending on the age of your PC.


Getting devices ready 50%

STEP 5 Expect your PC to also restart several times during the installation process. It's not something that can be done quickly unfortunately but when you see this blue screen appear (no, it's not like an old 'blue screen of death' from earlier versions of Windows) you know the real setup is about to begin.

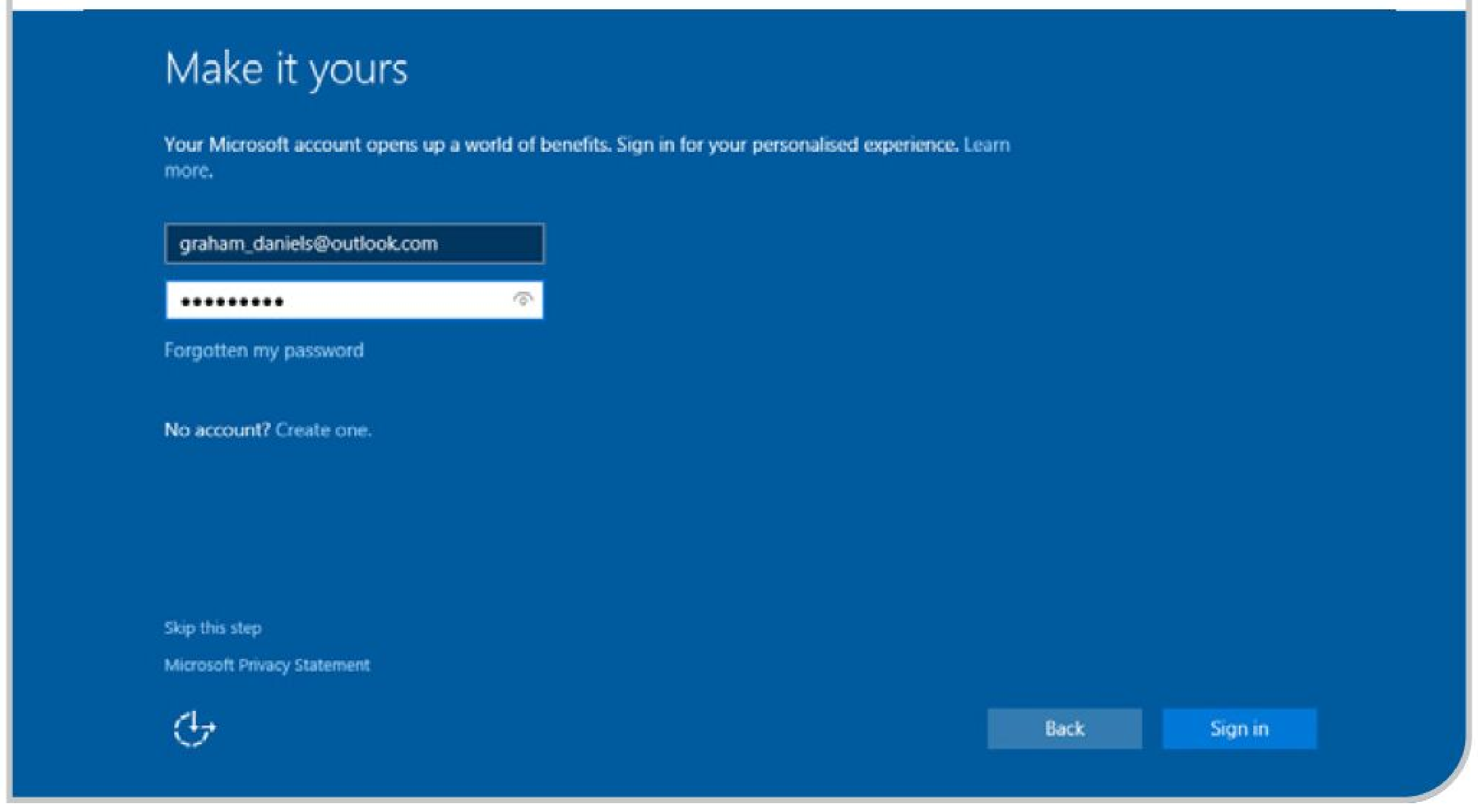

Just a moment...

STEP 6 You may be asked to identify whether this PC belongs to a company or if it's for personal use. This is because you're installing Windows 10 Pro here, rather than Windows 10 Home; naturally, different rules apply for PCs being used in a business environment. Click Next to move through the process of setting up more personal preferences.


Who owns this PC?

This choice is important, and it isn't easy to switch later. If this PC belongs to your organisation, signing in with that ID will give you access to their resources.

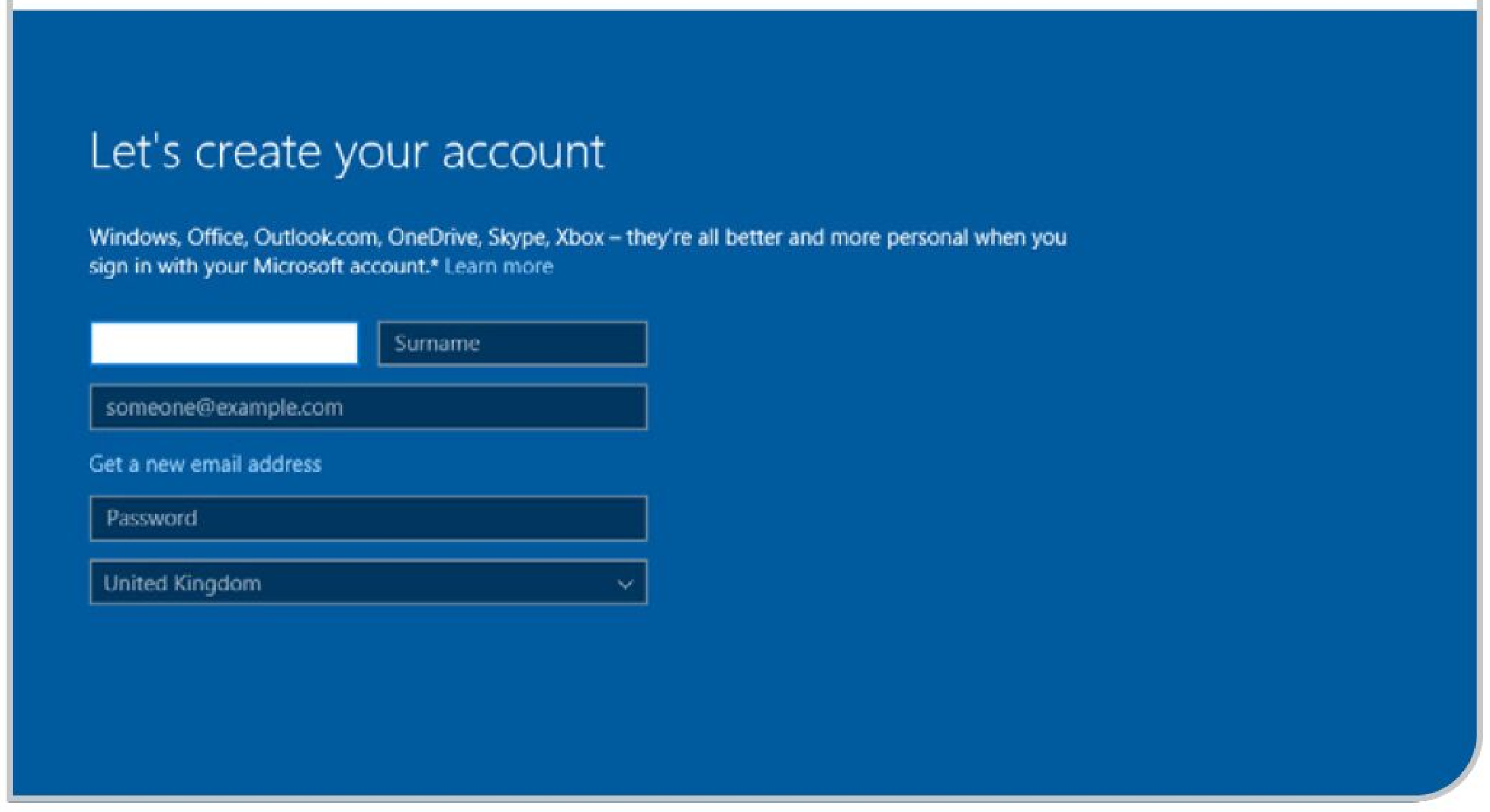
STEP 7 Next you'll be asked to sign in with your Microsoft account. You almost certainly do have one and if you have an Outlook.com, Hotmail or Xbox account you can use those details. You should be able to use Skype details if you sign in with an email address too. You can also retrieve a lost password if you've forgotten yours.


Make it yours

Your Microsoft account opens up a world of benefits. Sign in for your personalised experience. Learn more.

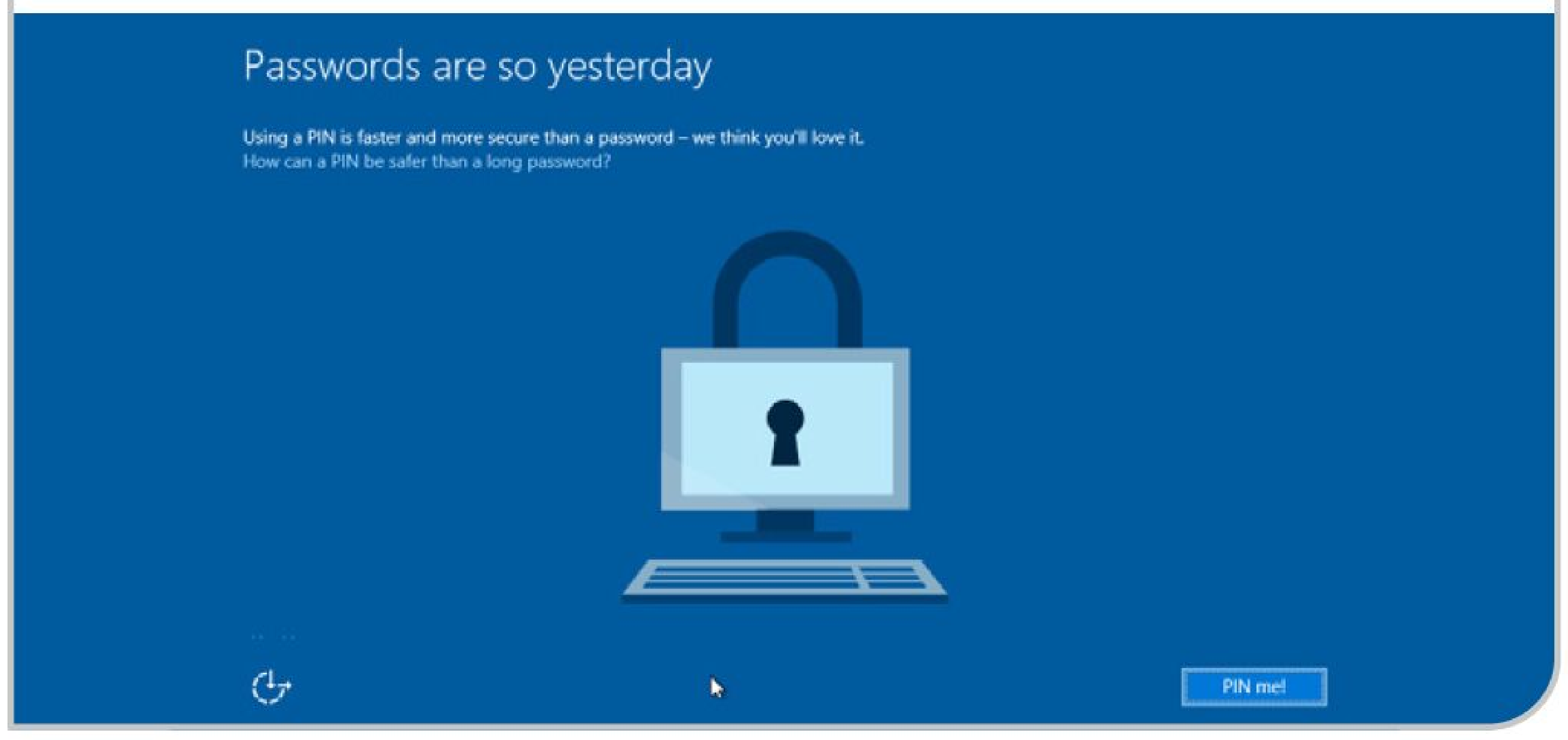
graham_daniels@outlook.com
•••••••••

STEP 8 If you don't have a Microsoft account, you can still sign up for one from the screen you saw in the previous step. You'll only need to provide basic details and you can choose whether to create a new email address or just use an existing one. You don't need to use a Hotmail or Outlook.com email address.


Let's create your account

Windows, Office, Outlook.com, OneDrive, Skype, Xbox – they're all better and more personal when you sign in with your Microsoft account.* Learn more

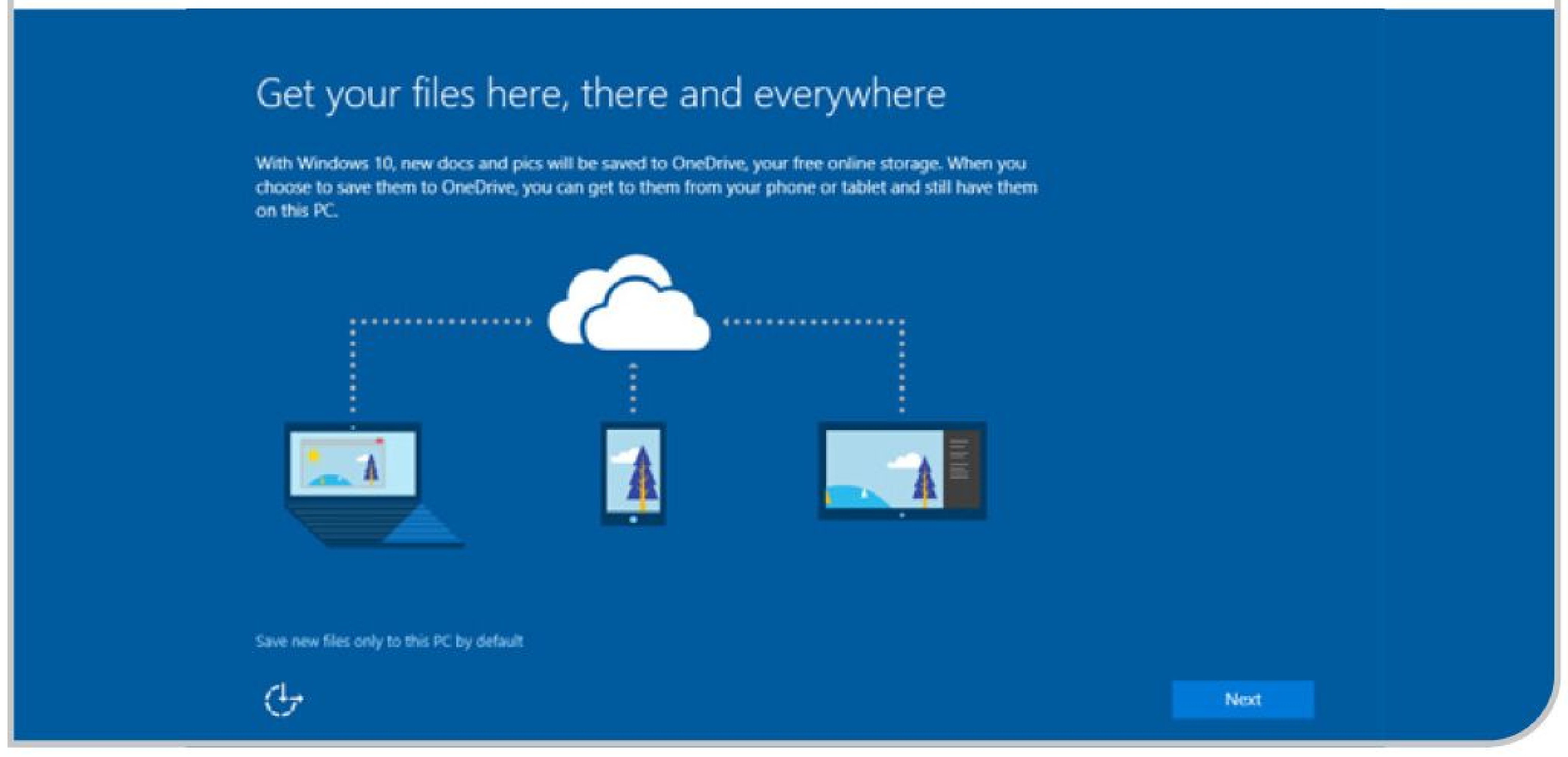
STEP 9 Next you’re going to set up a PIN. Despite what it says on this screen, passwords are still very much key to Windows 10 and it’s still the ultimate way of accessing and retrieving your information. However, it’s faster to sign in with a PIN, so that’s what you’ll set up. PIN codes are four digits exactly the same as with your bank card; but do choose a different code to the one used for your bank.



Passwords are so yesterday

Using a PIN is faster and more secure than a password – we think you'll love it.
How can a PIN be safer than a long password?

STEP 10 OneDrive is set up as a default in Windows 10 and we’ve explained a lot more about it on page 32; basically it is Microsoft’s cloud storage system that enables you to access your files on multiple devices. If you don’t want this or you use an alternative, click Save New Files Only to This PC by Default.

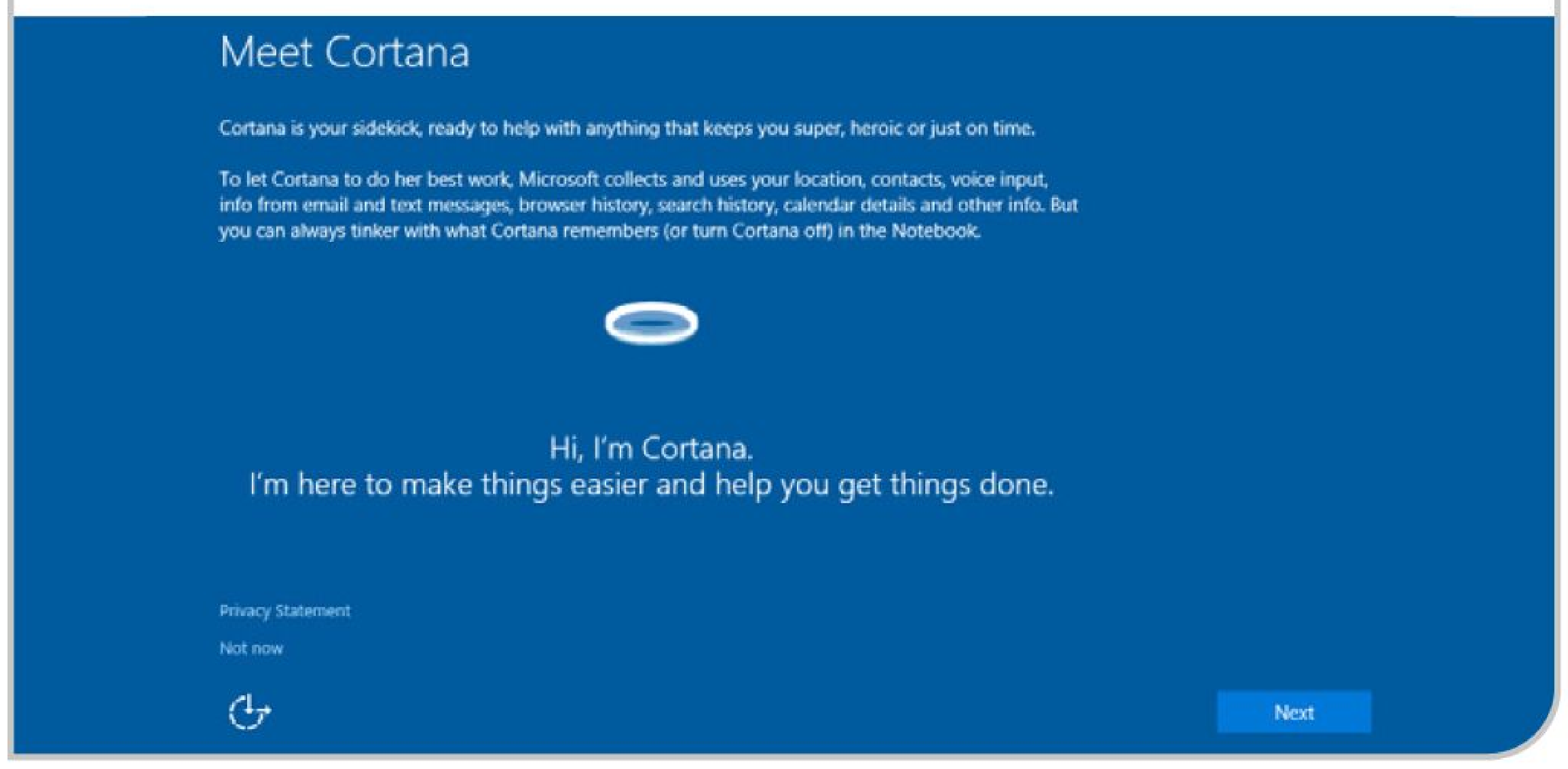


Get your files here, there and everywhere

With Windows 10, new docs and pics will be saved to OneDrive, your free online storage. When you choose to save them to OneDrive, you can get to them from your phone or tablet and still have them on this PC.

Save new files only to this PC by default

STEP 11 Cortana is the virtual assistant within Windows 10. It can provide you with useful information such as weather, upcoming appointments and so on. However, you’ll need to give it permission to collect information from your PC; or rather, you’ll need to opt out if you don’t want it. Click Not Now if that is the case.



Meet Cortana

Cortana is your sidekick, ready to help with anything that keeps you super, heroic or just on time.

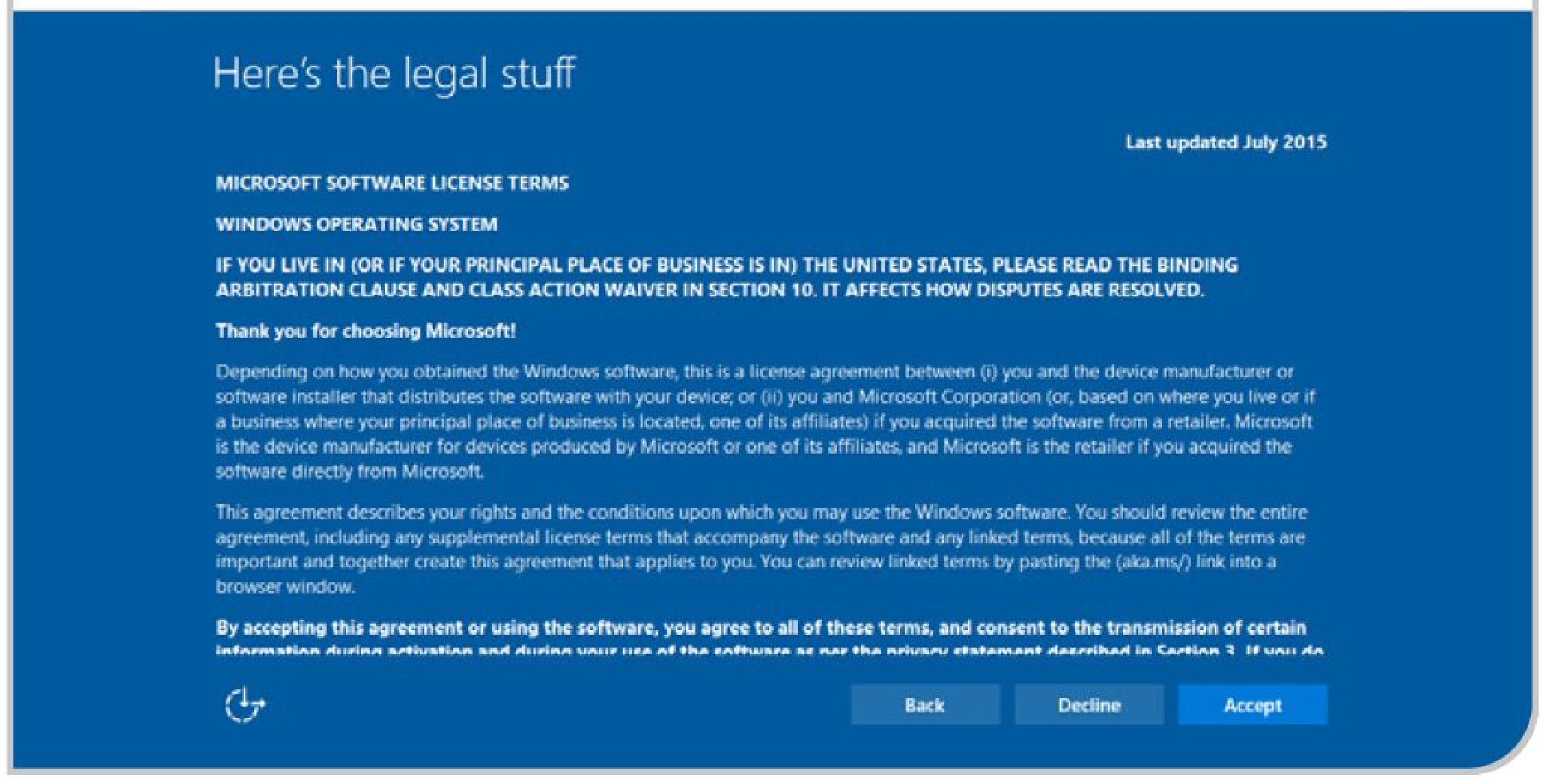
To let Cortana to do her best work, Microsoft collects and uses your location, contacts, voice input, info from email and text messages, browser history, search history, calendar details and other info. But you can always tinker with what Cortana remembers (or turn Cortana off) in the Notebook.

Hi, I'm Cortana.
I'm here to make things easier and help you get things done.

Privacy Statement

Not now

STEP 12 The legal agreement is a standard part of signing into any new software and Windows 10 is no different. It contains all the standard legal stuff, which we should all really read through, but few of us actually do. Unless you’re intending to stop using your PC at this point, you will need to click Accept.



Here's the legal stuff

Last updated July 2015

MICROSOFT SOFTWARE LICENSE TERMS

WINDOWS OPERATING SYSTEM

IF YOU LIVE IN (OR IF YOUR PRINCIPAL PLACE OF BUSINESS IS IN) THE UNITED STATES, PLEASE READ THE BINDING ARBITRATION CLAUSE AND CLASS ACTION WAIVER IN SECTION 10. IT AFFECTS HOW DISPUTES ARE RESOLVED.

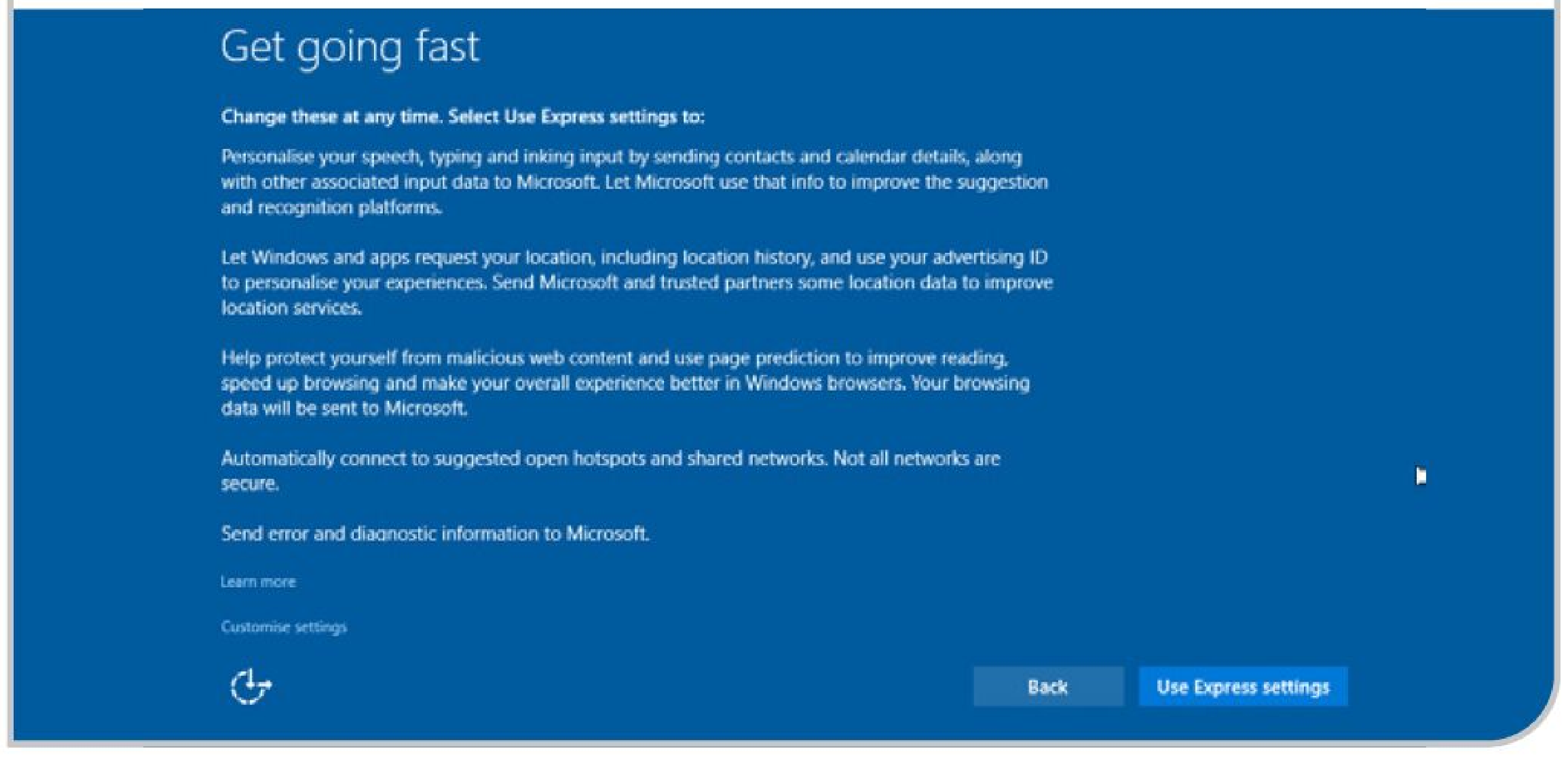
Thank you for choosing Microsoft!

Depending on how you obtained the Windows software, this is a license agreement between (i) you and the device manufacturer or software installer that distributes the software with your device; or (ii) you and Microsoft Corporation (or, based on where you live or if a business where your principal place of business is located, one of its affiliates) if you acquired the software from a retailer. Microsoft is the device manufacturer for devices produced by Microsoft or one of its affiliates, and Microsoft is the retailer if you acquired the software directly from Microsoft.

This agreement describes your rights and the conditions upon which you may use the Windows software. You should review the entire agreement, including any supplemental license terms that accompany the software and any linked terms, because all of the terms are important and together create this agreement that applies to you. You can review linked terms by pasting the (aka.ms/) link into a browser window.

By accepting this agreement or using the software, you agree to all of these terms, and consent to the transmission of certain

STEP 13 Next you’re offered ‘Get going fast’. This allows you to set up Windows 10 a bit faster, by using some default settings, which is fine for most users (you can always change them later). Most of the settings are fairly standard but if you want to check them, choose Customise Settings and go through them individually.



Get going fast

Change these at any time. Select Use Express settings to:

Personalise your speech, typing and inking input by sending contacts and calendar details, along with other associated input data to Microsoft. Let Microsoft use that info to improve the suggestion and recognition platforms.

Let Windows and apps request your location, including location history, and use your advertising ID to personalise your experiences. Send Microsoft and trusted partners some location data to improve location services.

Help protect yourself from malicious web content and use page prediction to improve reading, speed up browsing and make your overall experience better in Windows browsers. Your browsing data will be sent to Microsoft.

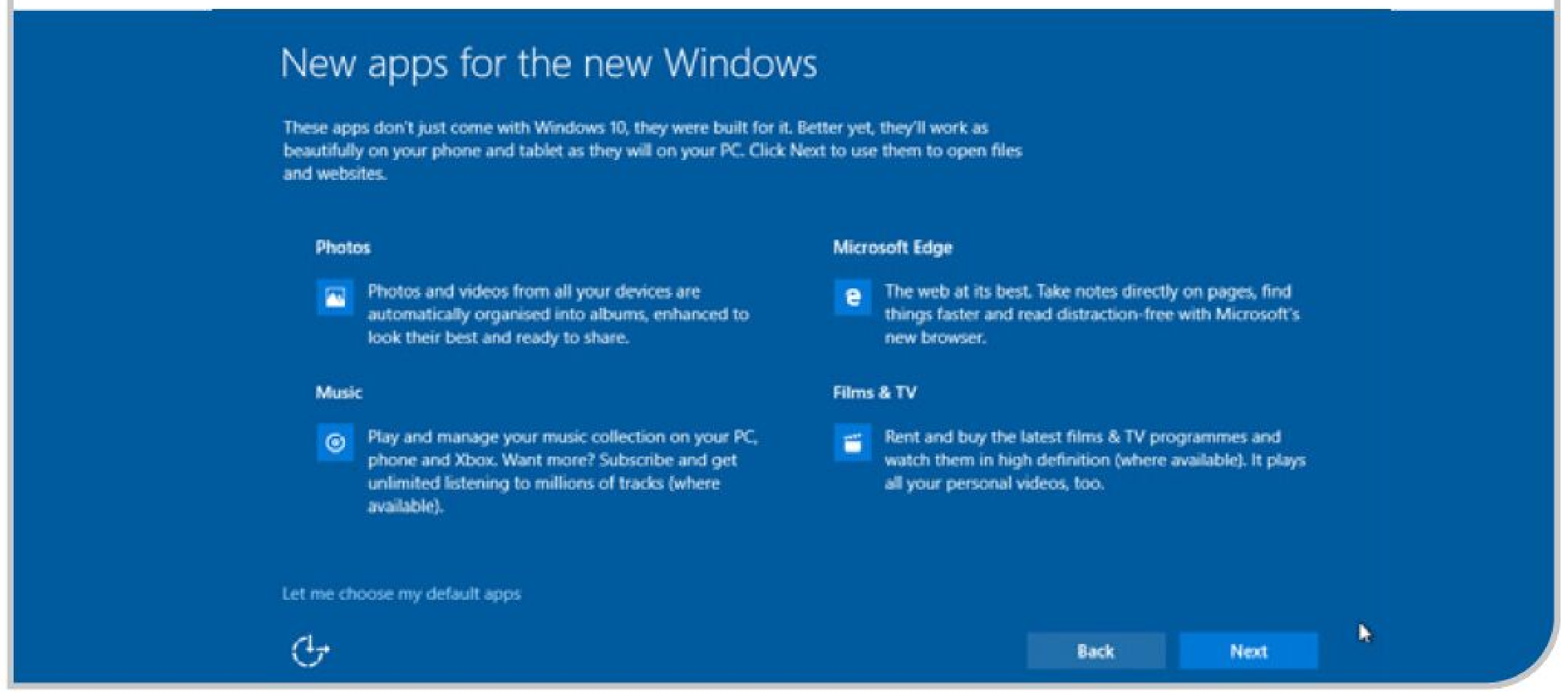
Automatically connect to suggested open hotspots and shared networks. Not all networks are secure.

Send error and diagnostic information to Microsoft.

Learn more

Customise settings

STEP 14 This screen tells you about the new standard default apps. It’s a bit sneaky as this is Microsoft’s way of telling you that these will be the default apps for web browsing, looking at photos, listening to music and watching videos. You can always use other apps of course, but if you want to alter the default at this stage, select Let Me Choose My Default Apps.



New apps for the new Windows

These apps don't just come with Windows 10, they were built for it. Better yet, they'll work as beautifully on your phone and tablet as they will on your PC. Click Next to use them to open files and websites.

Photos

Photos and videos from all your devices are automatically organised into albums, enhanced to look their best and ready to share.

Microsoft Edge

The web at its best. Take notes directly on pages, find things faster and read distraction-free with Microsoft's new browser.

Music

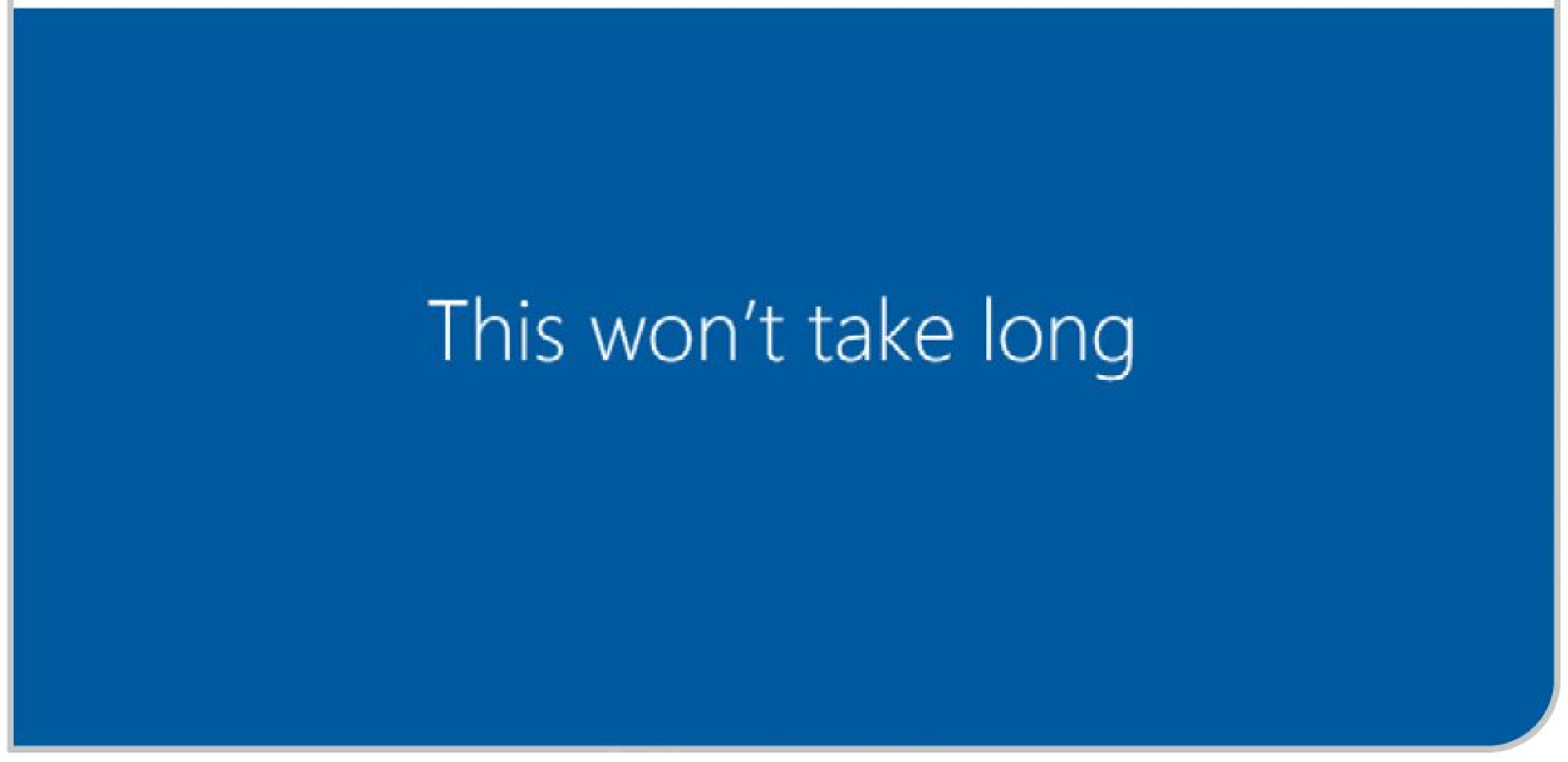
Play and manage your music collection on your PC, phone and Xbox. Want more? Subscribe and get unlimited listening to millions of tracks (where available).

Films & TV

Rent and buy the latest films & TV programmes and watch them in high definition (where available). It plays all your personal videos, too.

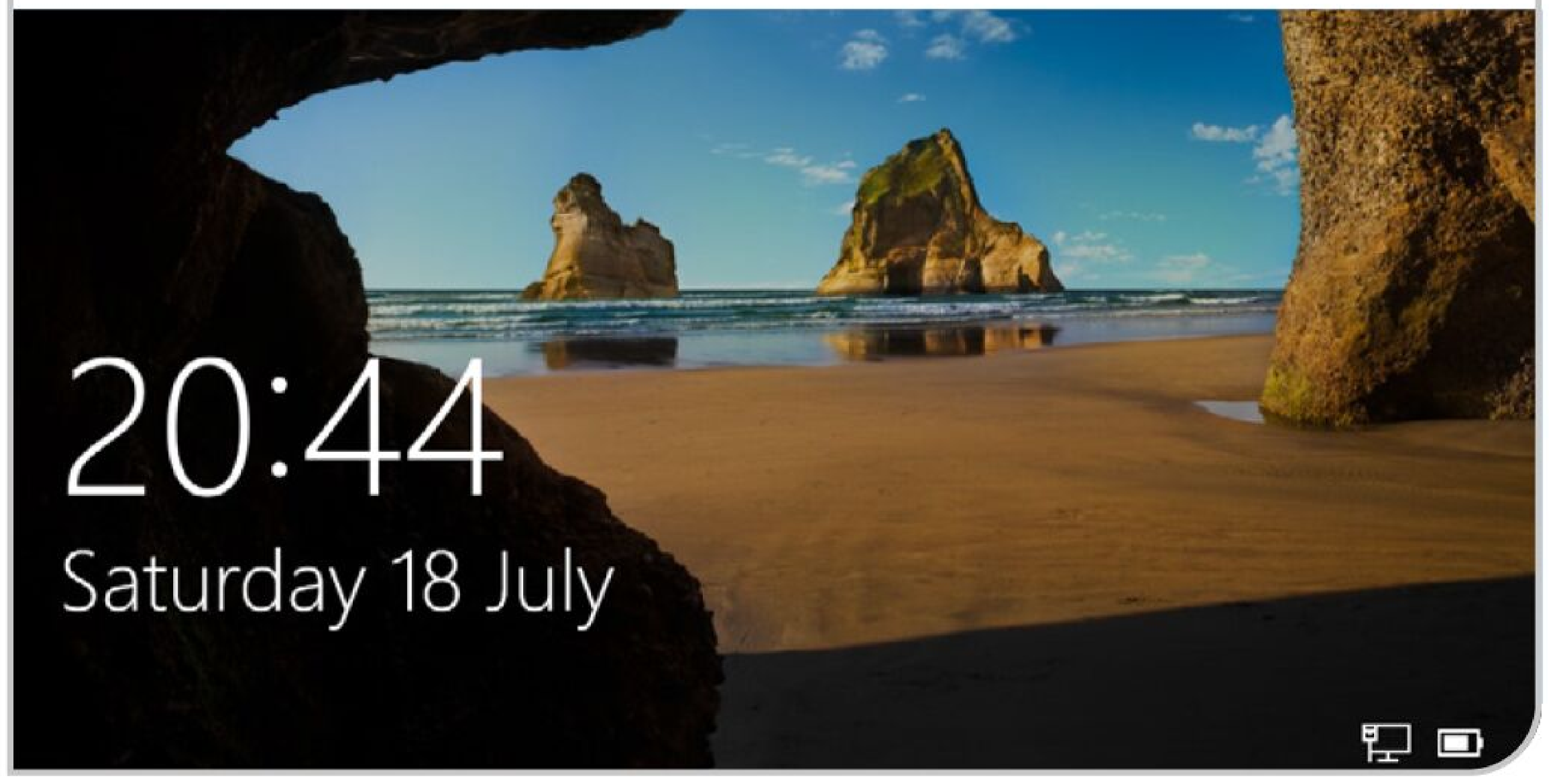
Let me choose my default apps

STEP 15 You'll then see this screen and it may be present for a few minutes. Windows takes a bit of time to configure the apps you use with your PC and makes sure they're configured correctly for Windows 10. This process could be slow if you had a lot of older apps installed but as this is a fairly new PC, it should only take a few seconds.



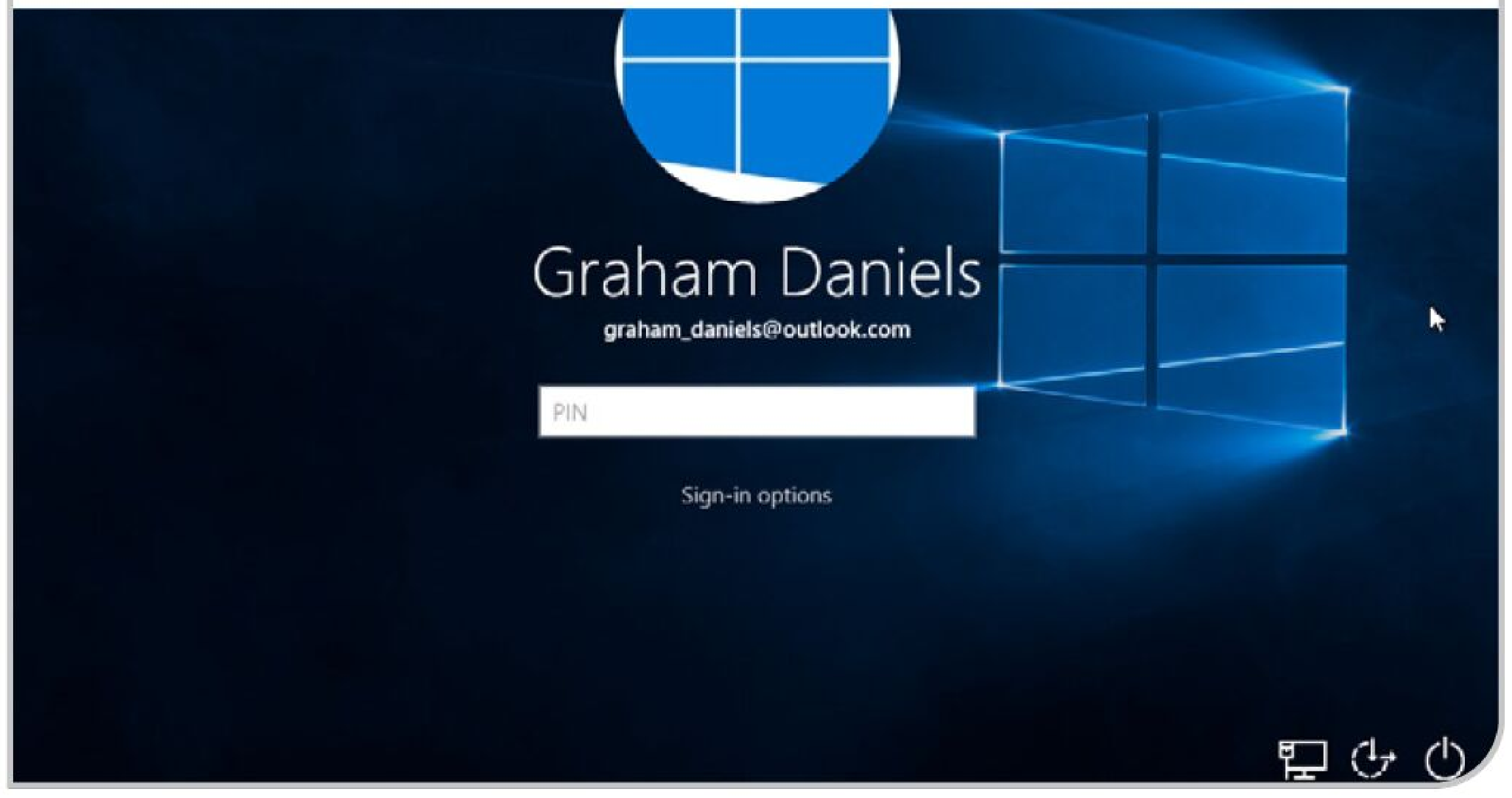
This won't take long

STEP 16 The next screen you see should be the lock screen. If you were a Windows 8.1 user, this will be familiar to you. If you're a Windows 7 user, this will be new, as there was no lock screen as such in Windows 7. Click anywhere to reveal the sign in page. Windows 10 always needs to be signed in to, unlike older versions.



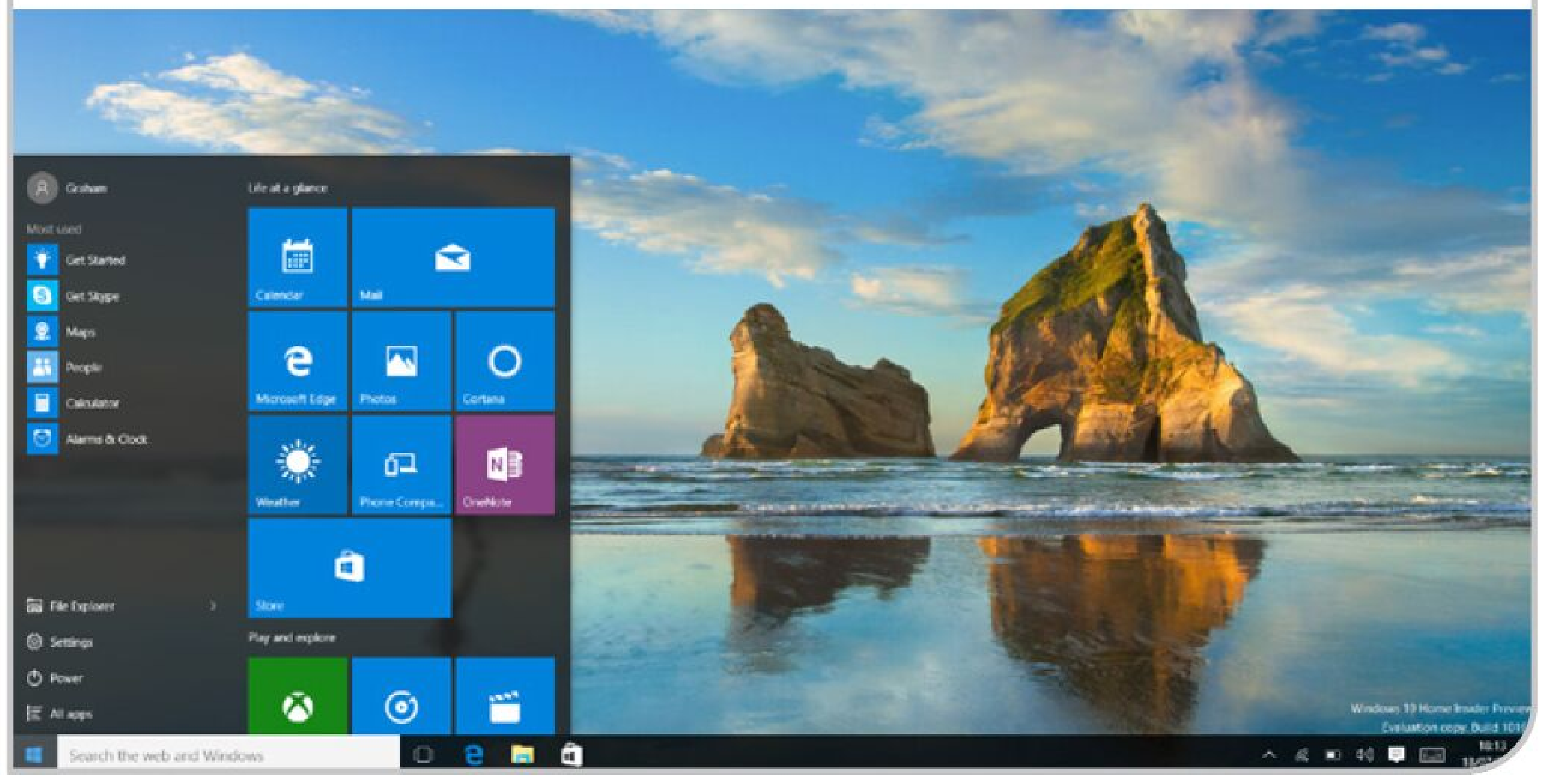
20:44
Saturday 18 July

STEP 17 You'll note that you're now asked to sign in with your new PIN code but you can click Sign-in Options should you need to sign in with your password. Note that you can also shut down or restart your PC from here using the controls in the bottom right.



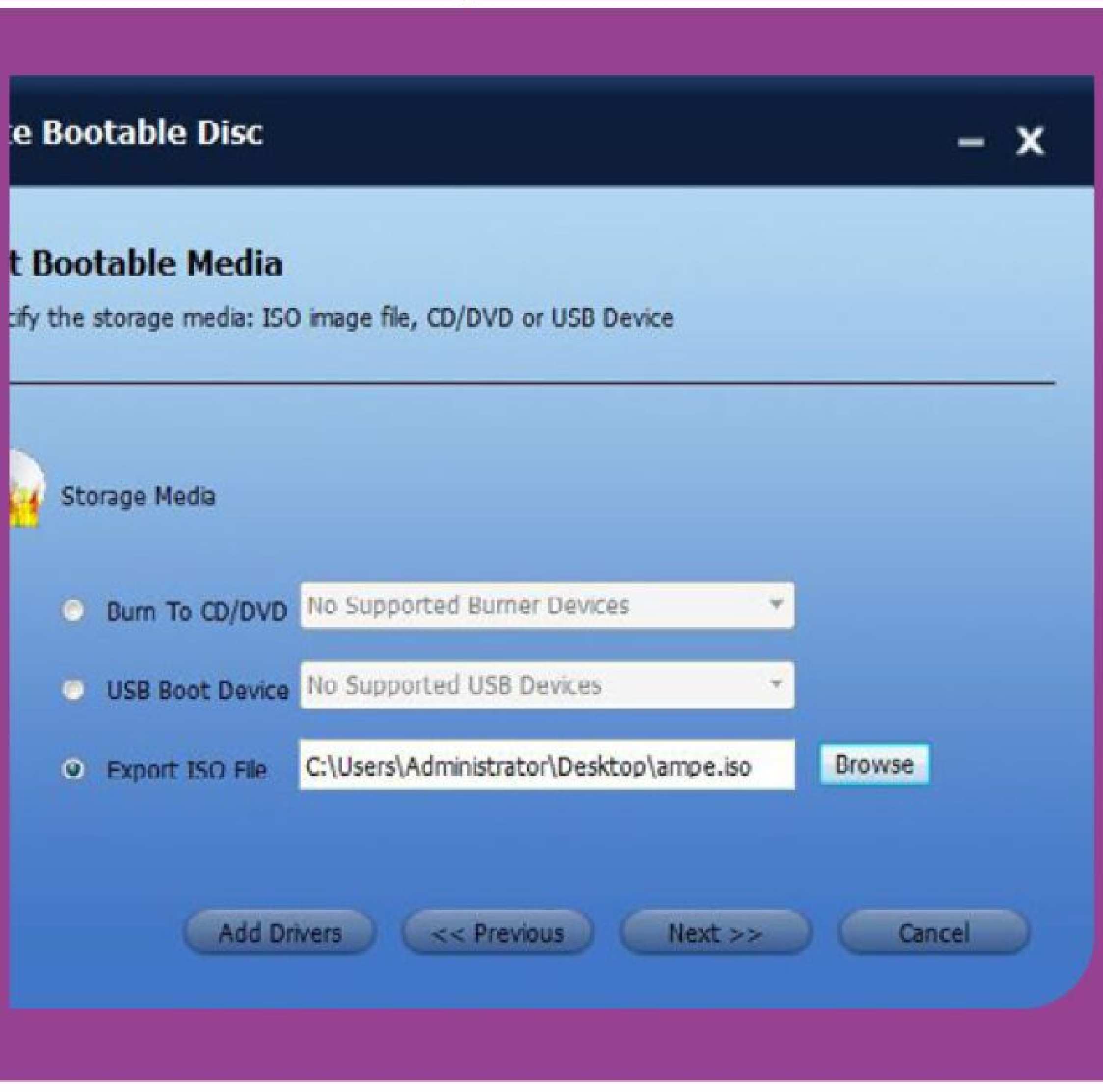
Graham Daniels
graham_daniels@outlook.com
PIN
Sign-in options

STEP 18 Here's your new desktop. As you can see all the key apps are arranged in the Start menu but you can take them out of the 'tiles' area and add whatever you wish. Everything is still accessible via 'All apps'. Follow any further on screen instructions to complete setup and you can then start updating drivers, etc.



WINDOWS 10 ANNIVERSARY

The Windows 10 Anniversary Update is full of new features and innovations that bring Windows Ink and Cortana to life; a faster, more accessible and more power efficient Microsoft Edge browser, advanced security features, new gaming experiences and more too. You don't have to do anything to get the Windows 10 Anniversary Update. It will roll out automatically to you through Windows Update if you've chosen to have updates installed automatically on your device.

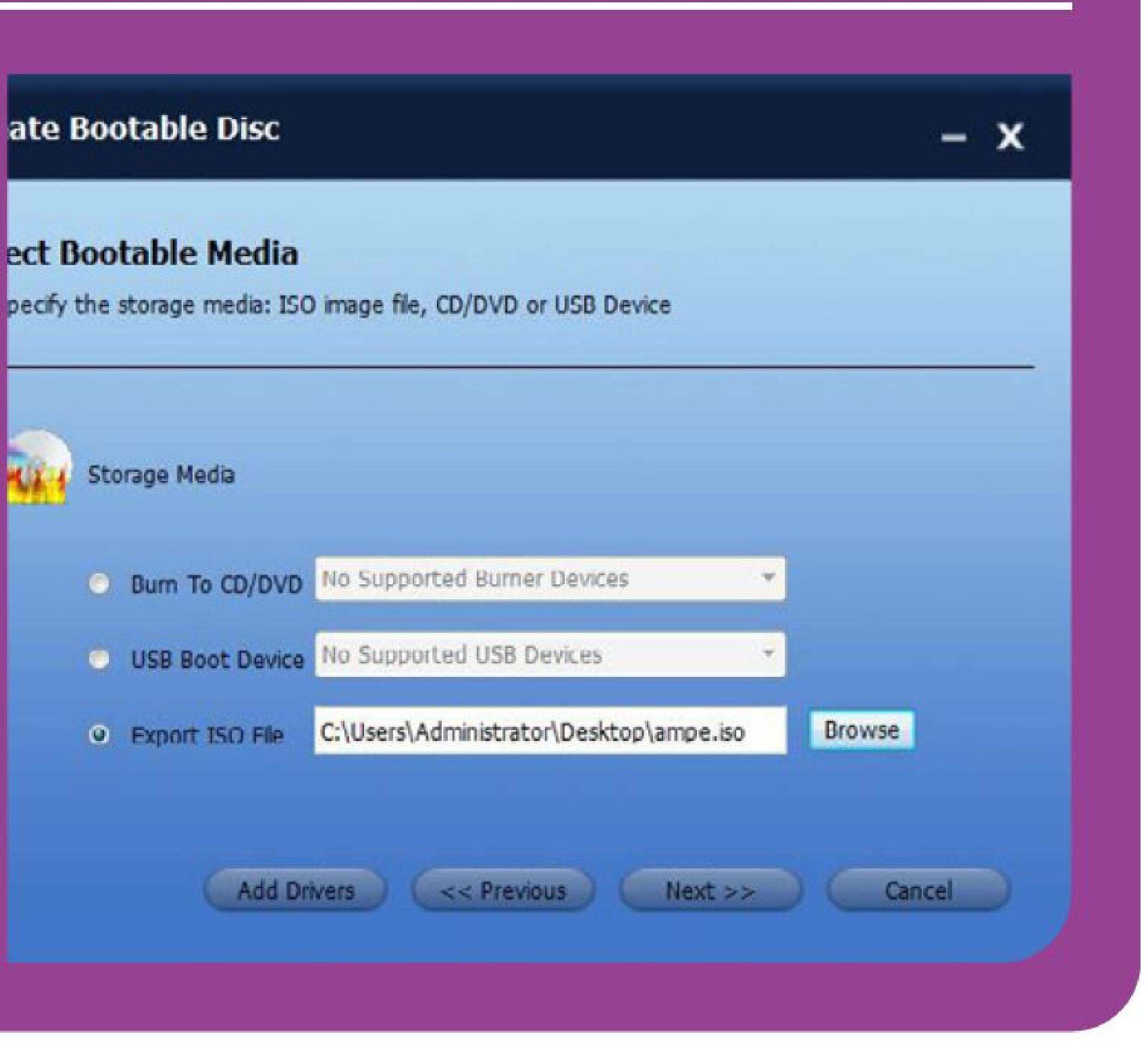


e Bootable Disc

t Bootable Media
cify the storage media: ISO image file, CD/DVD or USB Device

Storage Media

○ Burn To CD/DVD: No Supported Burner Devices
○ USB Boot Device: No Supported USB Devices
● Export ISO File: C:\Users\Administrator\Desktop\ampe.iso



ate Bootable Disc

ect Bootable Media
pecify the storage media: ISO image file, CD/DVD or USB Device

Storage Media

○ Burn To CD/DVD: No Supported Burner Devices
○ USB Boot Device: No Supported USB Devices
● Export ISO File: C:\Users\Administrator\Desktop\ampe.iso

Updating Your Motherboard BIOS

The BIOS (Basic Input/Output System) is an often overlooked but absolutely vital part of your computer system. You see it every time you switch your computer on as it's responsible for those lines of text that flash up on the screen before Windows launches, listing things like installed RAM and other hardware details. To run Windows 10 at optimum performance you'll need to update it.

WHAT DOES THE BIOS DO?

The BIOS is the core software of your system. It boots up the computer, launches Windows and in some cases allows Windows and apps to access things like hard drives, the keyboard, USB connections and other hardware components. The BIOS is built into your system and is stored on a type of flash memory chip on your computer's motherboard. For this reason it is often referred to as "firmware", since it is comprised of software and hardware. The BIOS is particular to each type of motherboard and is provided by the motherboard manufacturer.

To get the best performance and system stability under Windows 10, it's important to make sure that your computer is running the latest version of its BIOS. So in this tutorial we will show you how to check the current version; and then download an update and install it.

It's important to note that the BIOS is a vital part of your computer and messing up the update process can cause irreparable damage to your system, possibly rendering it useless. For this reason we recommend that you only undertake this process if you are confident that you know what you're doing. If you have any doubts, ask a computer literate friend to help, or take the PC to your local computer store. They will be happy to perform the update for you, usually for a small fee. It's also a good idea to perform a full backup, to an external storage device, of any important data on your system before you begin, just in case!

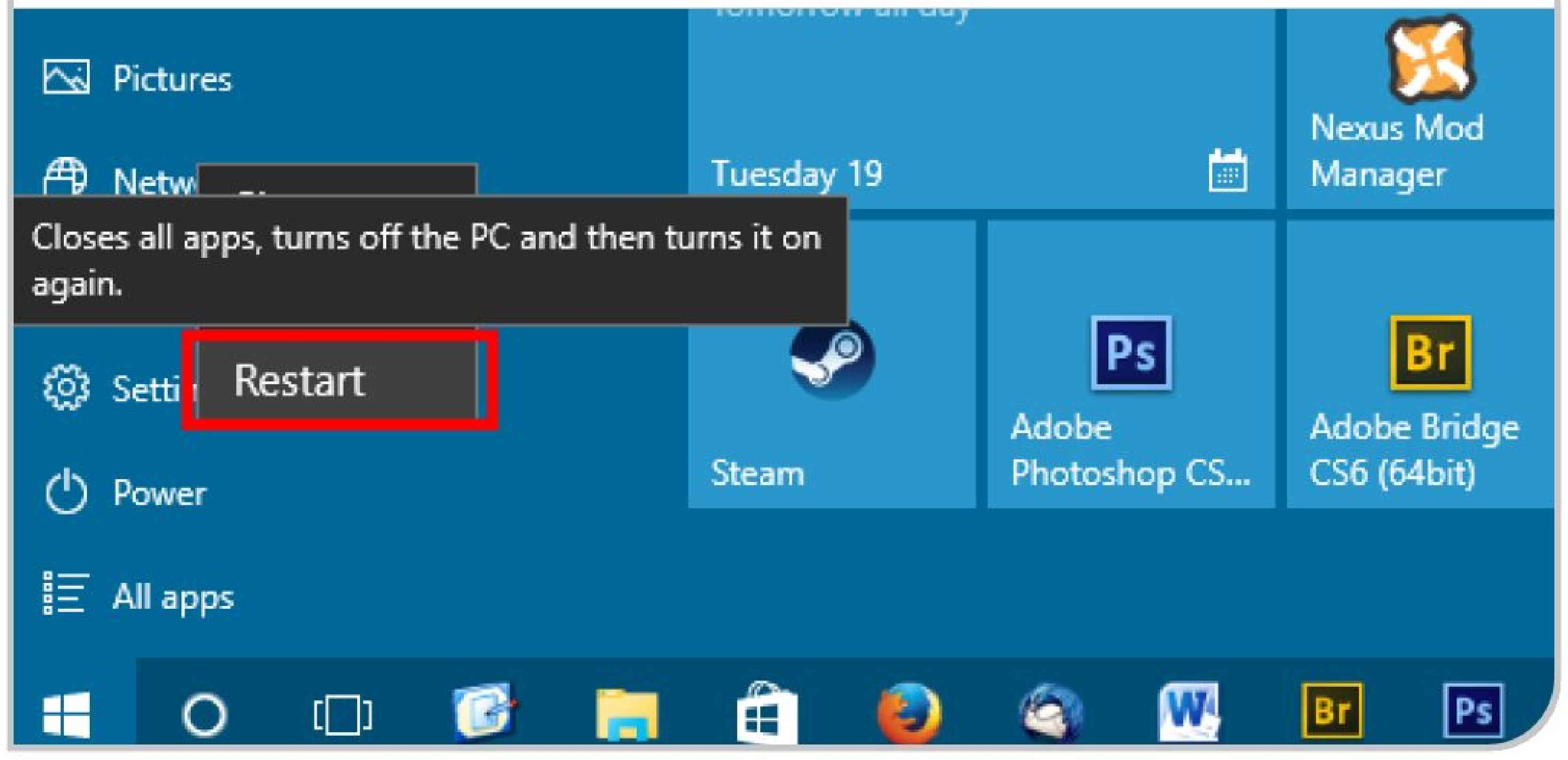
DISCLAIMER

Updating the BIOS carries the risk of damaging your PC and you may also void the warranty on your equipment. If you are not completely confident that you can carry out this operation safely DO NOT ATTEMPT IT. You do so entirely at your own risk. Black Dog Media cannot accept any responsibility for any damage to your property as a result of following this tutorial.

Checking your current BIOS version

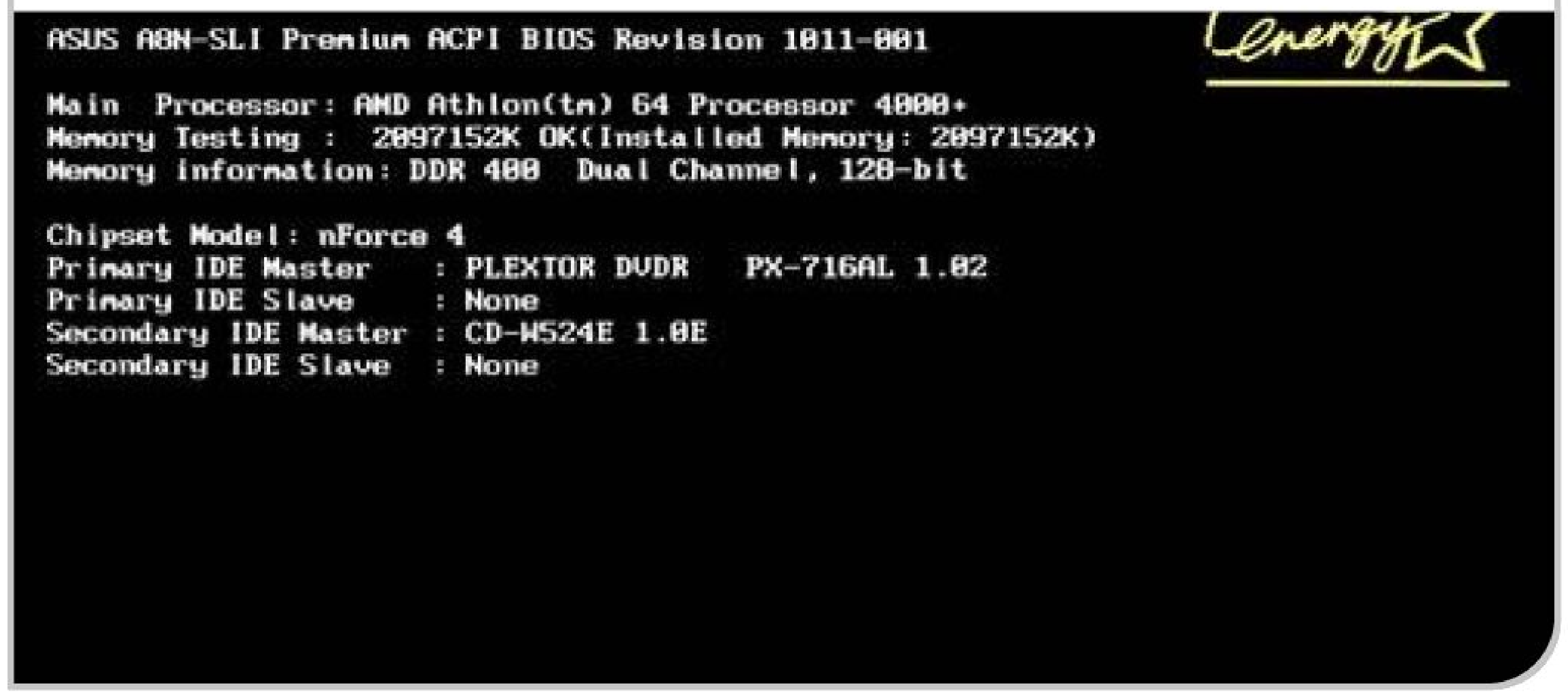
To check the current BIOS version you'll have to open the BIOS interface. The exact method varies depending on your motherboard manufacturer.

STEP 1 You will need the manual or specification sheet that came with your PC and a used but empty USB flash drive. Close all open apps, then click on the Start button and select Power and then Restart. This will shut down your PC and reboot it.



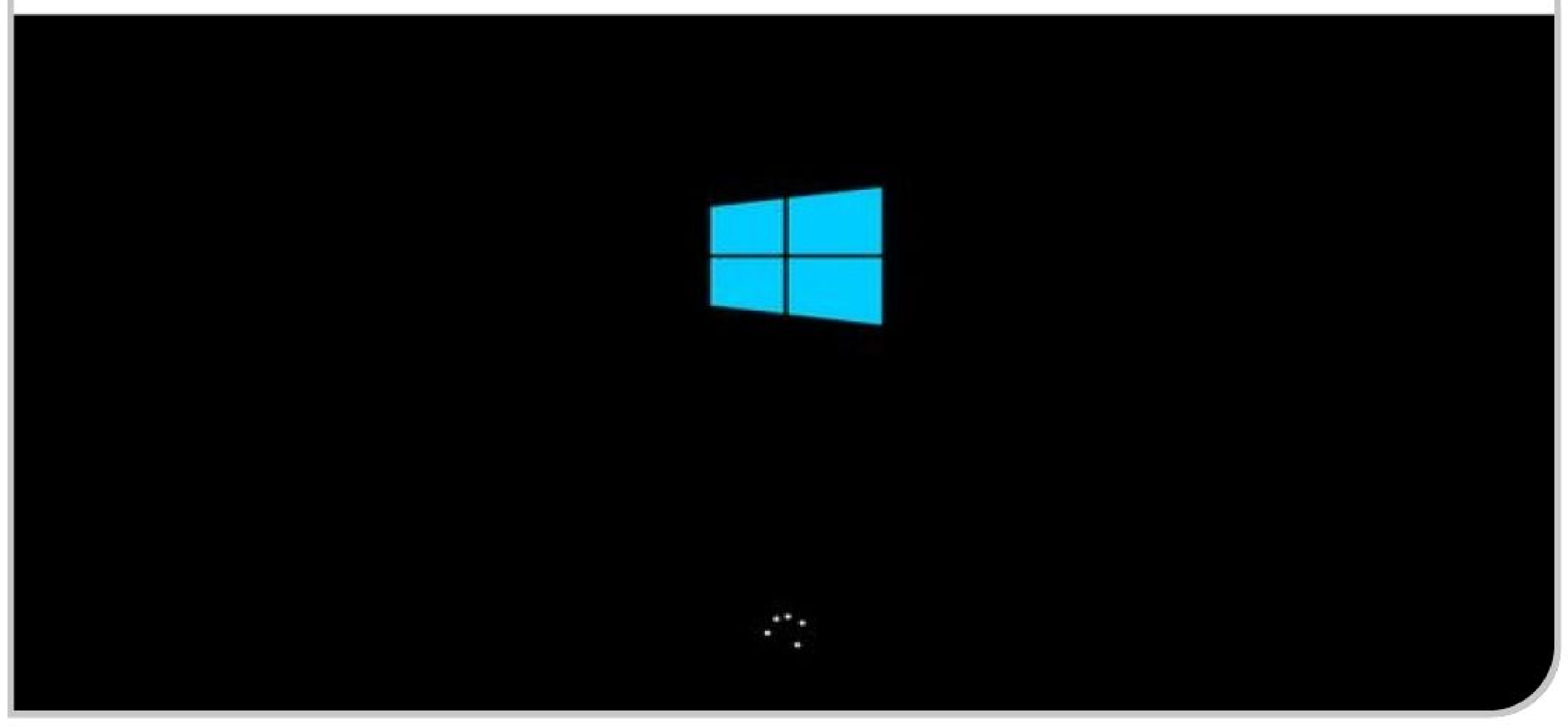
Closes all apps, turns off the PC and then turns it on again.

STEP 2 As your PC reboots watch for the BIOS messages that flash up on the screen. You're looking for a message that says something like "Press F2 to enter BIOS". The message varies. On some systems it's the Delete key, on some it's Esc or one of the F keys.

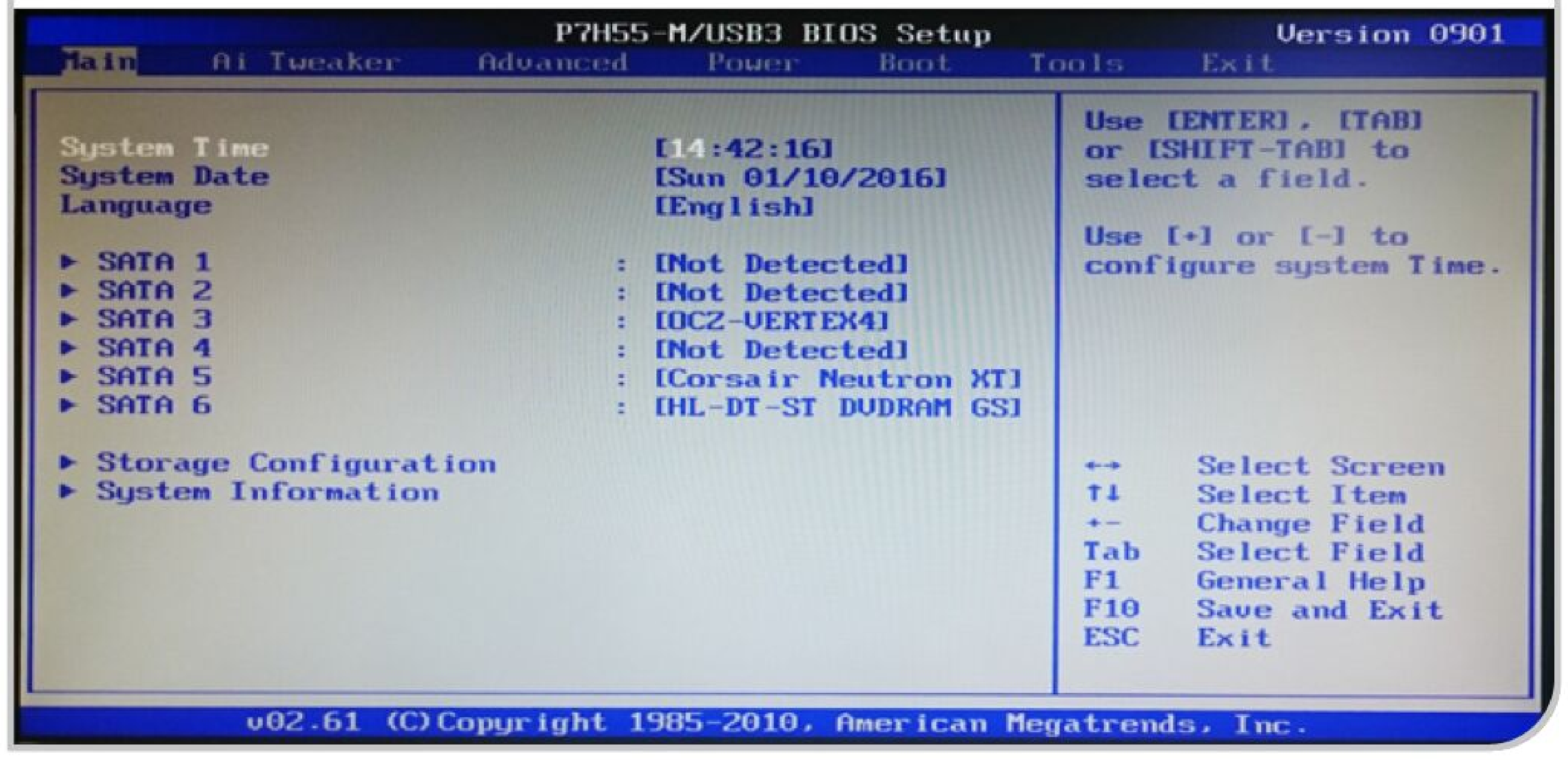


```
ASUS A8N-SLI Premium ACPI BIOS Revision 1011-001

Main  Processor: AMD Athlon(tm) 64 Processor 4000+
Memory Testing :  2097152K OK(Installed Memory: 2097152K)
Memory information: DDR 400  Dual Channel, 128-bit

Chipset Model: nForce 4
Primary IDE Master    : PLEXTOR DVDR   PX-716AL 1.02
Primary IDE Slave     : None
Secondary IDE Master  : CD-W524E 1.0E
Secondary IDE Slave   : None
```

STEP 3 Restart your PC again but this time as it reboots, repeatedly press the indicated keyboard key. If Windows launches you've pressed the wrong key, so restart and try again. If you don't know which key it should be, try Delete, Esc, F1, F2, F8, F10 or F12.

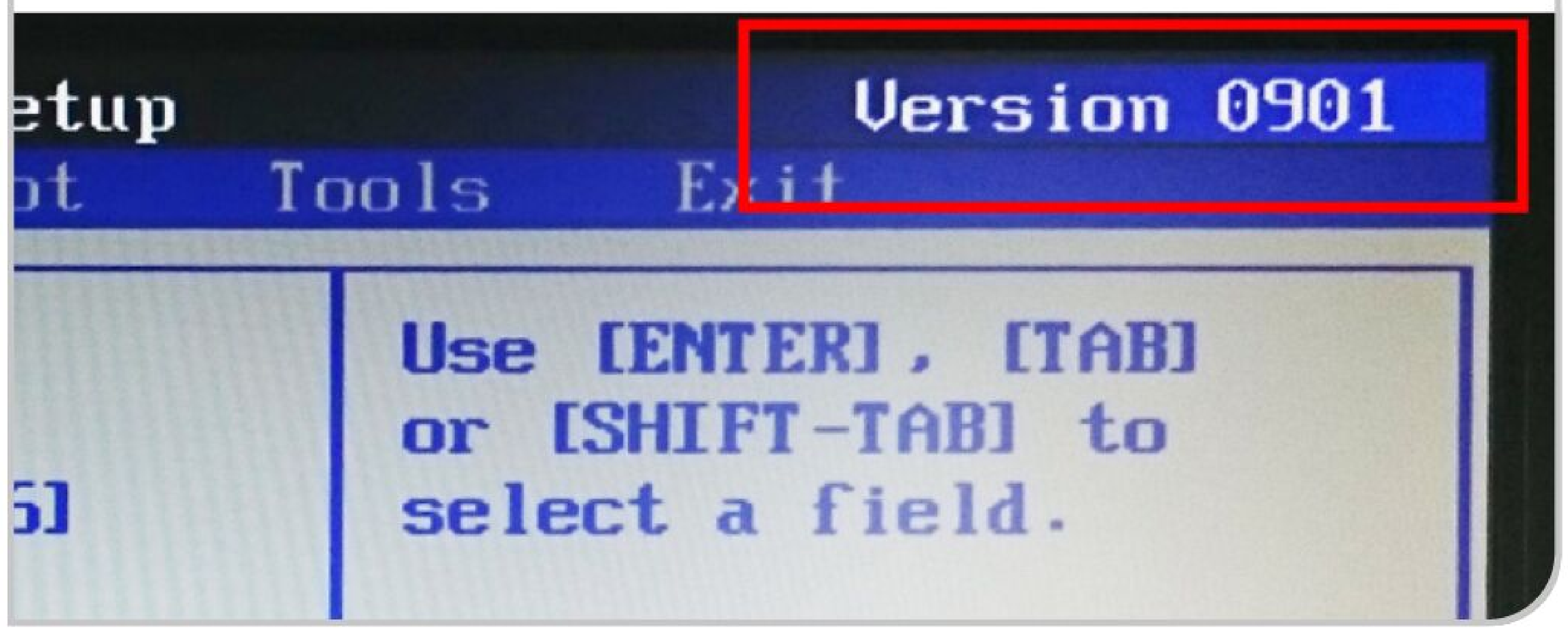


STEP 4 When you find the right key, you should see the BIOS configuration screen appear. This is usually a low resolution screen with blocky text and several pages of options. The style varies from one manufacturer to another but this is the BIOS screen for a popular ASUS motherboard.



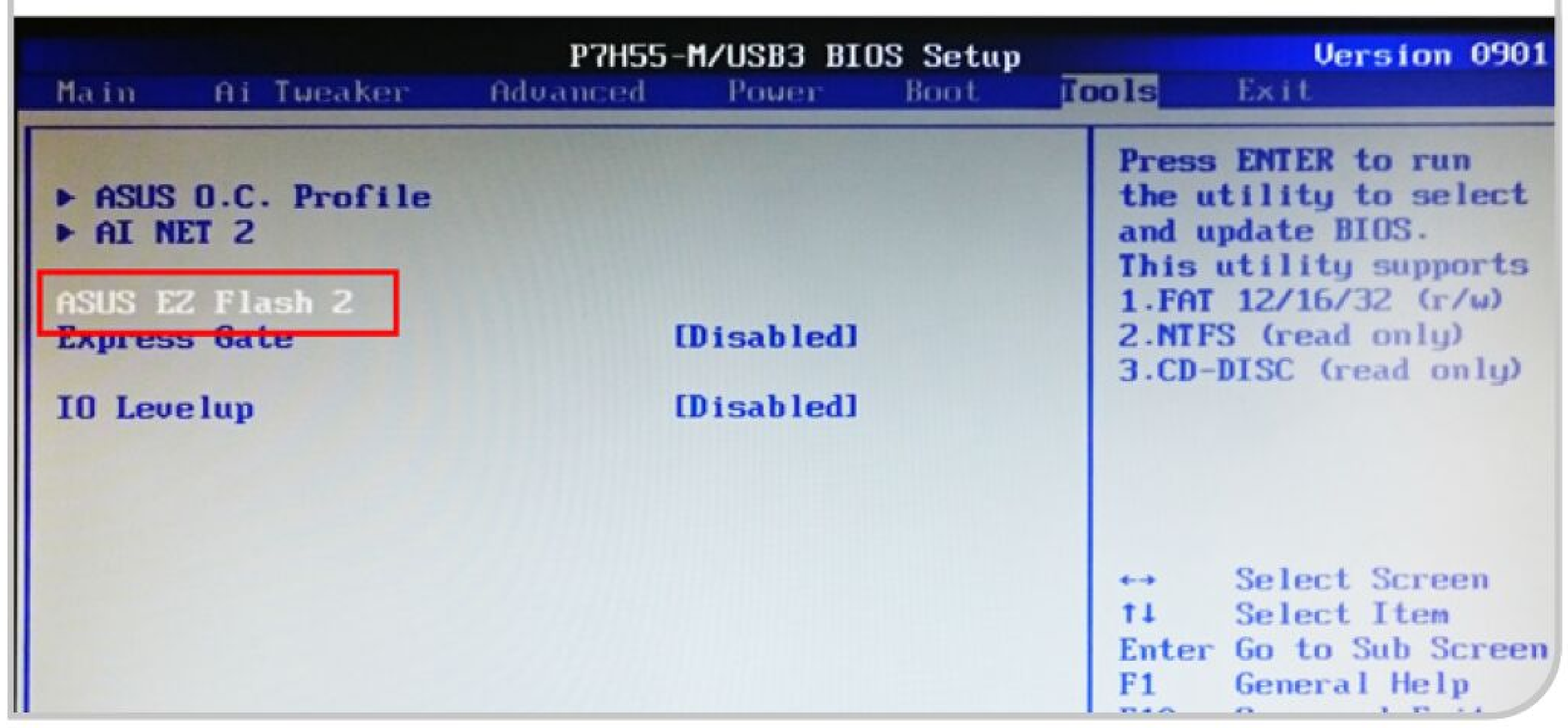
```
                  P7H55-M/USB3 BIOS Setup                    Version 0901
Main   Ai Tweaker   Advanced   Power   Boot   Tools   Exit

System Time                    [14:42:16]              Use [ENTER], [TAB]
System Date                    [Sun 01/10/2016]        or [SHIFT-TAB] to
Language                       [English]               select a field.

▶ SATA 1                     : [Not Detected]          Use [+] or [-] to
▶ SATA 2                     : [Not Detected]          configure system Time.
▶ SATA 3                     : [OCZ-VERTEX4]
▶ SATA 4                     : [Not Detected]
▶ SATA 5                     : [Corsair Neutron XT]
▶ SATA 6                     : [HL-DT-ST DVDRAM GS]

▶ Storage Configuration                                ←→    Select Screen
▶ System Information                                   ↑↓    Select Item
                                                       +-    Change Field
                                                       Tab   Select Field
                                                       F1    General Help
                                                       F10   Save and Exit
                                                       ESC   Exit

        v02.61 (C)Copyright 1985-2010, American Megatrends, Inc.
```

STEP 5 You should see the BIOS version number prominently displayed, usually at the top of the screen. Make a note of it. The mouse or trackpad won't work in BIOS, so use the arrow keys to navigate around the menu. Look for a BIOS update utility. If you find one, continue with this tutorial.



```
etup              Version 0901
ot     Tools     Exit

         Use [ENTER], [TAB]
         or [SHIFT-TAB] to
5]       select a field.
```

STEP 6 If you don't find a BIOS update utility in the BIOS menu, you'll need to read the next section, "Updating the BIOS using WinFlash". Navigate to the Exit tab, menu entry or press Esc. Select "Exit without saving", then press Enter. Windows should now launch normally.

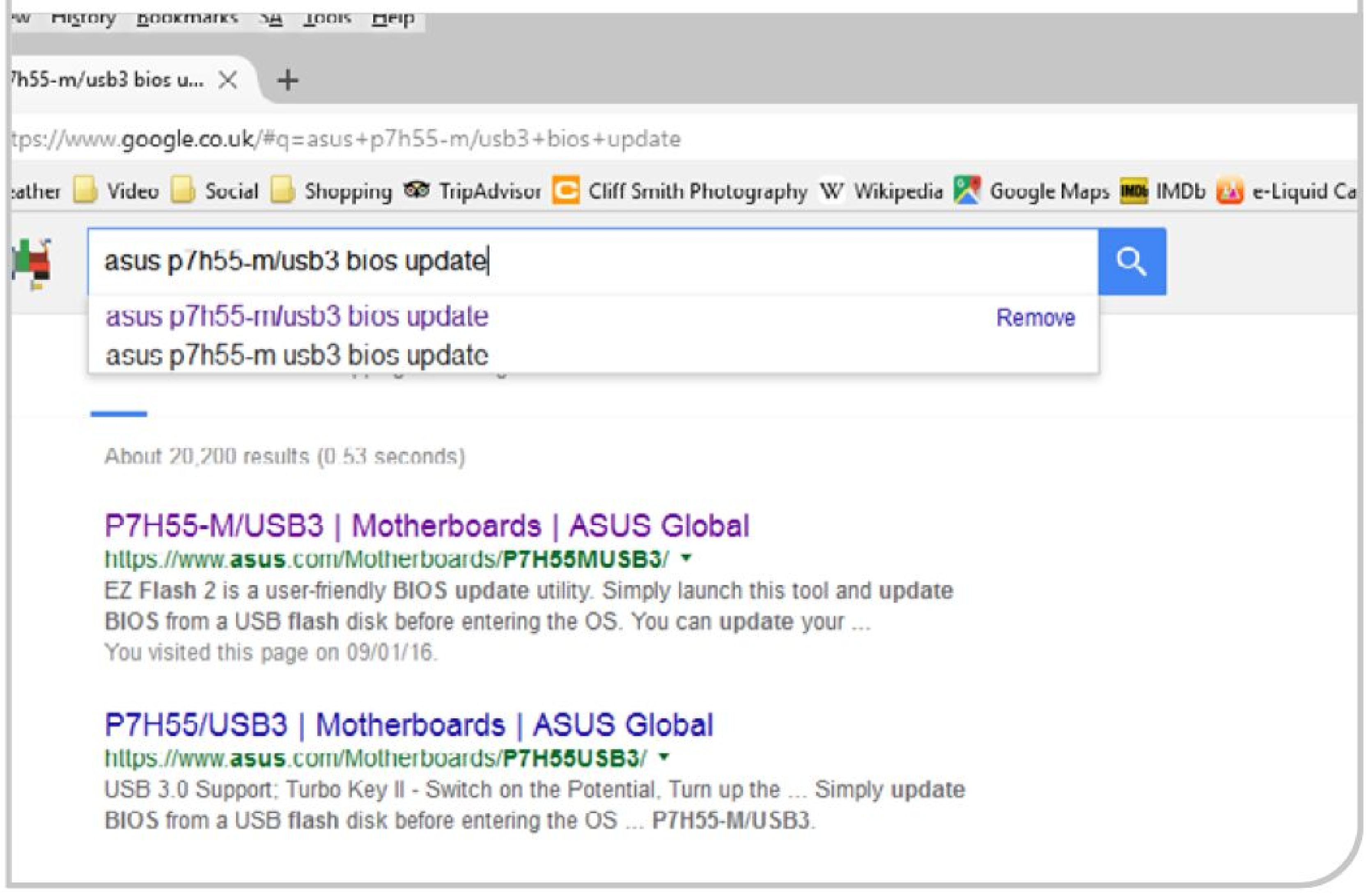


```
                  P7H55-M/USB3 BIOS Setup                    Version 0901
Main   Ai Tweaker   Advanced   Power   Boot   Tools   Exit

▶ ASUS O.C. Profile                                    Press ENTER to run
▶ AI NET 2                                             the utility to select
                                                       and update BIOS.
ASUS EZ Flash 2                                        This utility supports
Express Gate                   [Disabled]              1.FAT 12/16/32 (r/w)
                                                       2.NTFS (read only)
IO Levelup                     [Disabled]              3.CD-DISC (read only)

                                                       ←→    Select Screen
                                                       ↑↓    Select Item
                                                       Enter Go to Sub Screen
                                                       F1    General Help
```

Download a BIOS update

Once you've found out your BIOS version number, you'll need to check to see if an update is available. You'll have to do this whether your PC has a built-in BIOS update utility or not.

STEP 1 Since some computer manufacturer's websites hide vital update information, by far the easiest way to locate a BIOS update is to type your computer or motherboard model number into Google, along with "BIOS update".


w History Bookmarks SA Tools Help
7h55-m/usb3 bios u...
tps://www.google.co.uk/#q=asus+p7h55-m/usb3+bios+update
eather Video Social Shopping TripAdvisor Cliff Smith Photography Wikipedia Google Maps IMDb e-Liquid Ca
Remove

asus p7h55-m/usb3 bios update

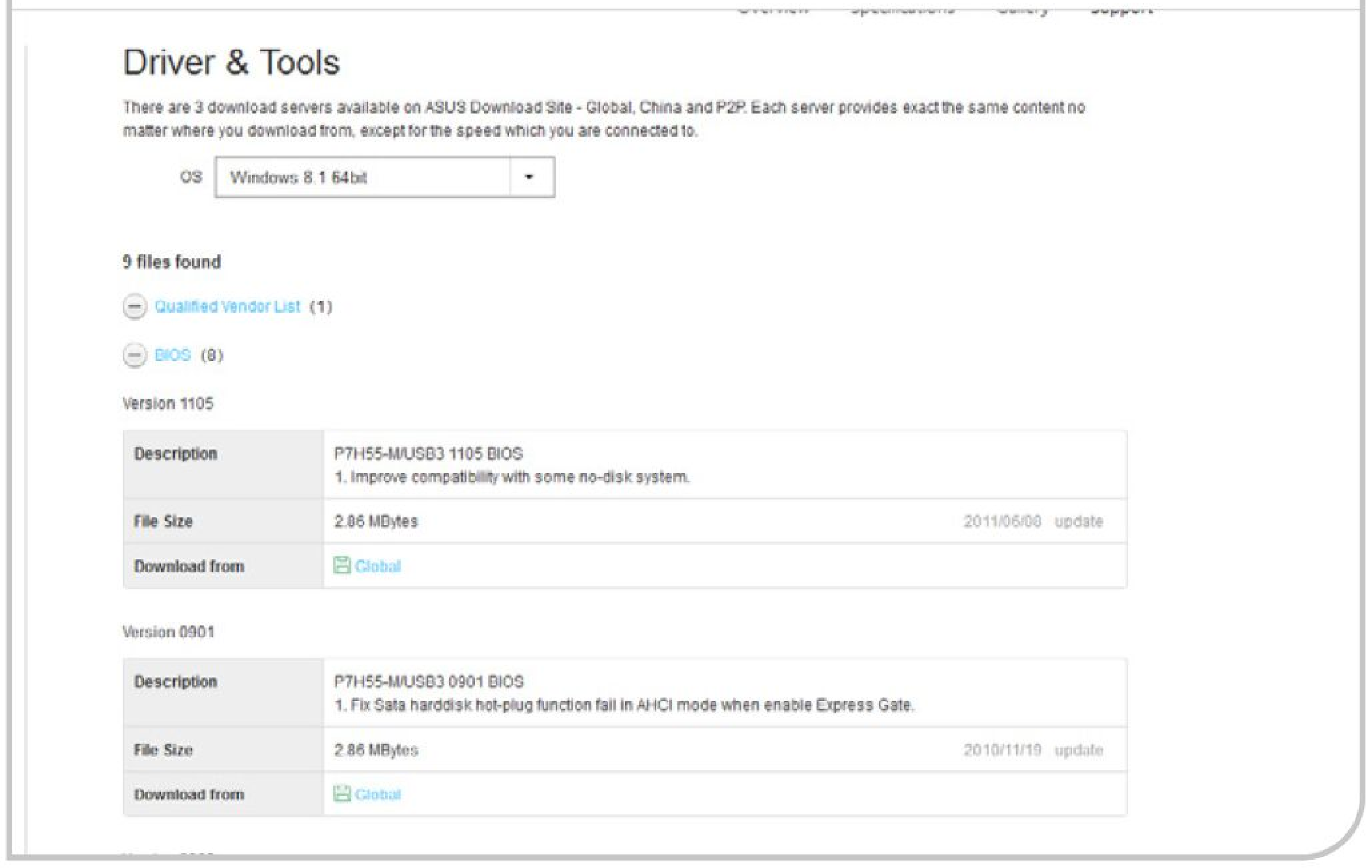
asus p7h55-m/usb3 bios update
asus p7h55-m usb3 bios update

About 20,200 results (0.53 seconds)

P7H55-M/USB3 | Motherboards | ASUS Global
https://www.asus.com/Motherboards/P7H55MUSB3/
EZ Flash 2 is a user-friendly BIOS update utility. Simply launch this tool and update BIOS from a USB flash disk before entering the OS. You can update your ...
You visited this page on 09/01/16.

P7H55/USB3 | Motherboards | ASUS Global
https://www.asus.com/Motherboards/P7H55USB3/
USB 3.0 Support; Turbo Key II - Switch on the Potential, Turn up the ... Simply update BIOS from a USB flash disk before entering the OS ... P7H55-M/USB3.

STEP 2 Once you've located the right page, click on the link for the BIOS version information. In most cases you should see a list of available BIOS versions. Check to see if any are more recent than the one you have.



Driver & Tools

There are 3 download servers available on ASUS Download Site - Global, China and P2P. Each server provides exact the same content no matter where you download from, except for the speed which you are connected to.

OS: Windows 8.1 64bit

9 files found

Qualified Vendor List (1)

BIOS (8)

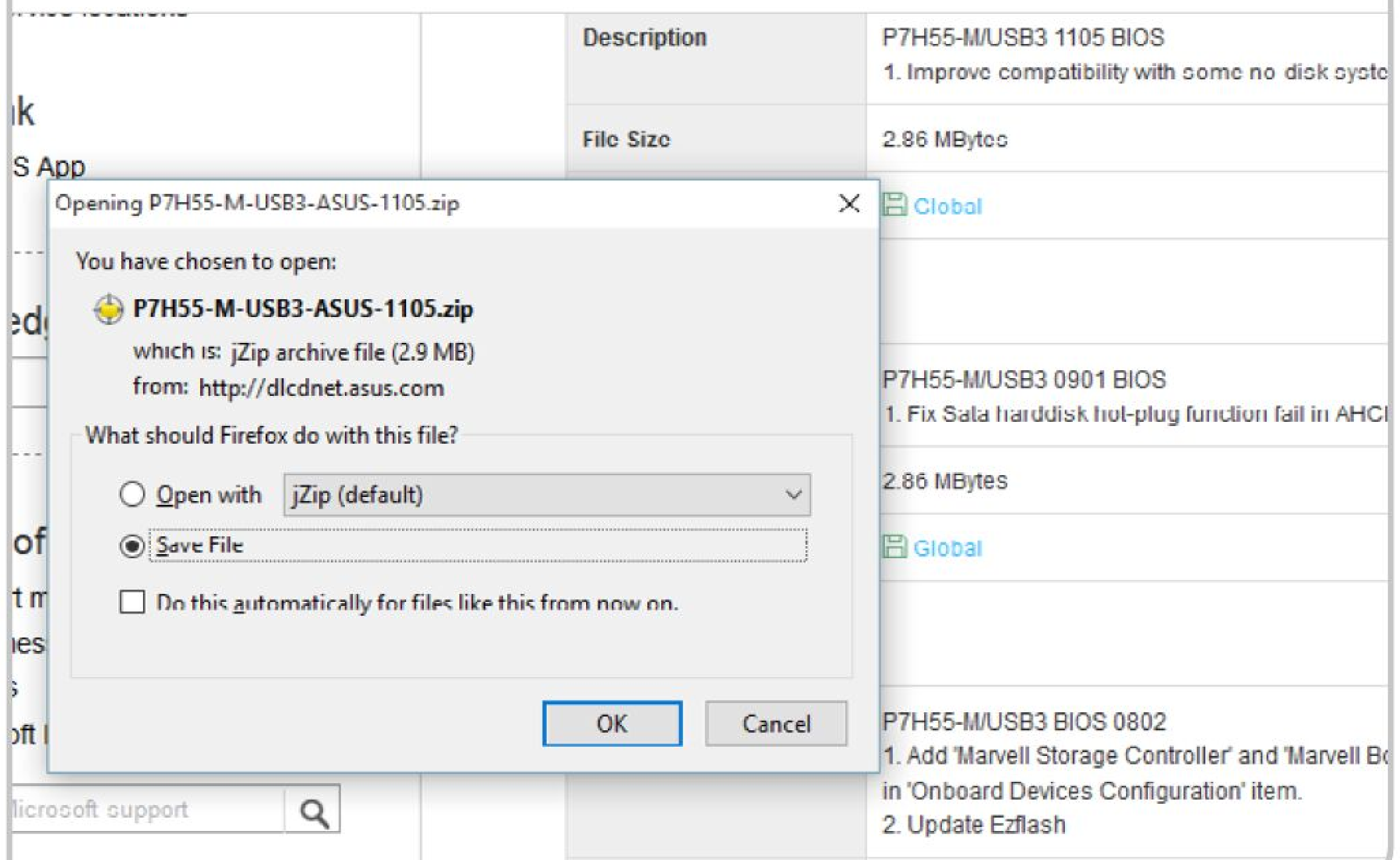
Version 1105

Description	P7H55-M/USB3 1105 BIOS 1. Improve compatibility with some no-disk system.
File Size	2.86 MBytes 2011/06/08 update
Download from	Global

Version 0901

Description	P7H55-M/USB3 0901 BIOS 1. Fix Sata harddisk hot-plug function fail in AHCI mode when enable Express Gate.
File Size	2.86 MBytes 2010/11/19 update
Download from	Global

STEP 3 You may see that there are updates that mention Windows 10 specifically. If there is a more recent BIOS version available than the one you have, click on the link to download it.



Opening P7H55-M-USB3-ASUS-1105.zip

You have chosen to open:

P7H55-M-USB3-ASUS-1105.zip
which is: jZip archive file (2.9 MB)
from: http://dlcdnet.asus.com

What should Firefox do with this file?

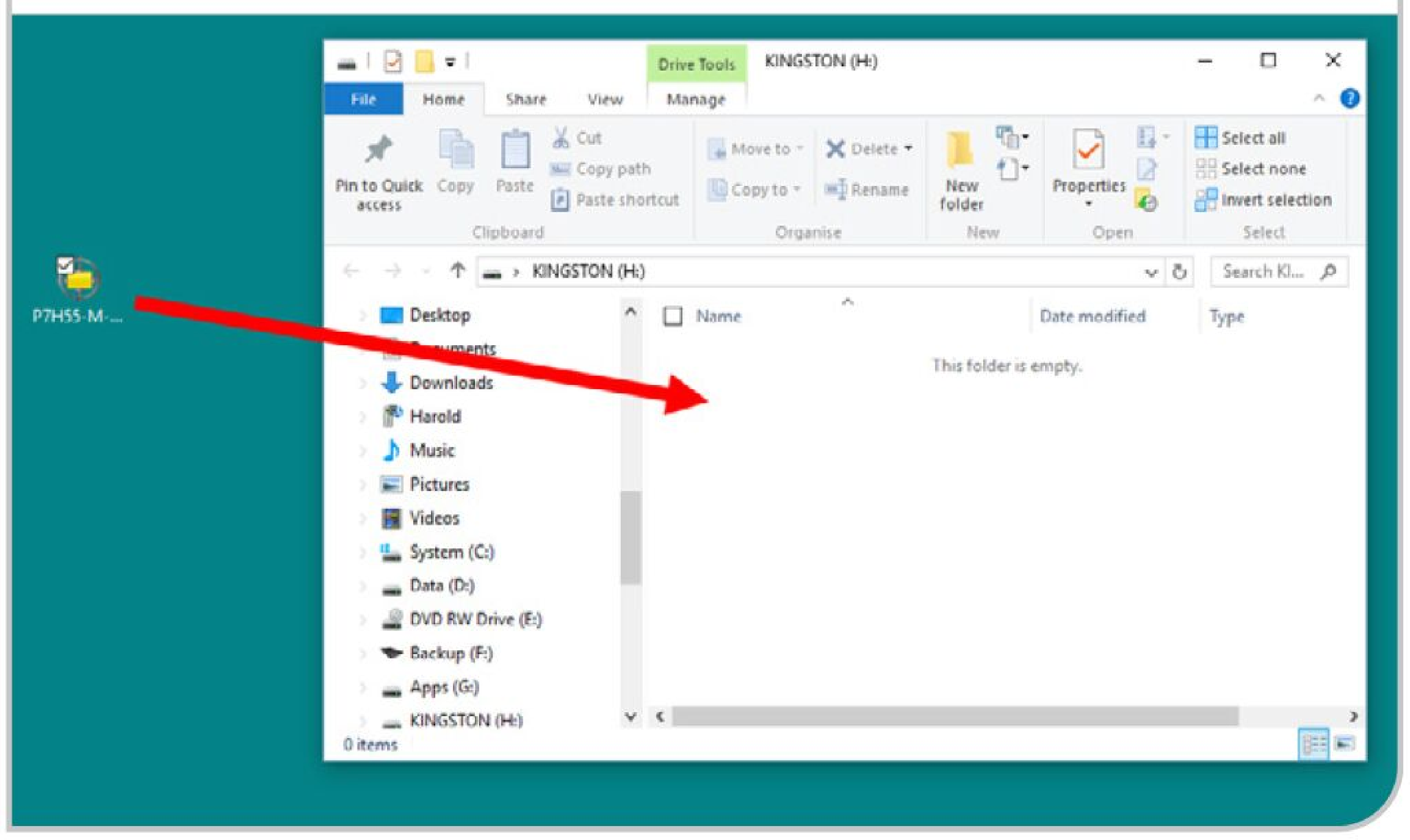
○ Open with jZip (default)
● Save File

☐ Do this automatically for files like this from now on.

OK
Cancel
Microsoft support

Description	P7H55-M/USB3 1105 BIOS 1. Improve compatibility with some no disk syste
File Size	2.86 MBytes
	Global
	P7H55-M/USB3 0901 BIOS 1. Fix Sata harddisk hot-plug function fail in AHCI
	2.86 MBytes
	Global
	P7H55-M/USB3 BIOS 0802 1. Add 'Marvell Storage Controller' and 'Marvell Bo in 'Onboard Devices Configuration' item. 2. Update Ezflash

STEP 4 When you find the right key, you should see the BIOS configuration screen appear. This is usually a low resolution screen with blocky text and several pages of options. The style varies from one manufacturer to another but this is the BIOS screen for a popular ASUS motherboard.


P7H55-M...
Drive Tools
KINGSTON (H:)
File
Home
Share
View
Manage
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organise
New folder
New
Properties
Open
Select all
Select none
Invert selection
Select
Search KI...
Desktop
Documents
Downloads
Harold
Music
Pictures
Videos
System (C:)
Data (D:)
DVD RW Drive (E:)
Backup (F:)
Apps (G:)
KINGSTON (H:)
Name
Date modified
Type
This folder is empty.
0 items

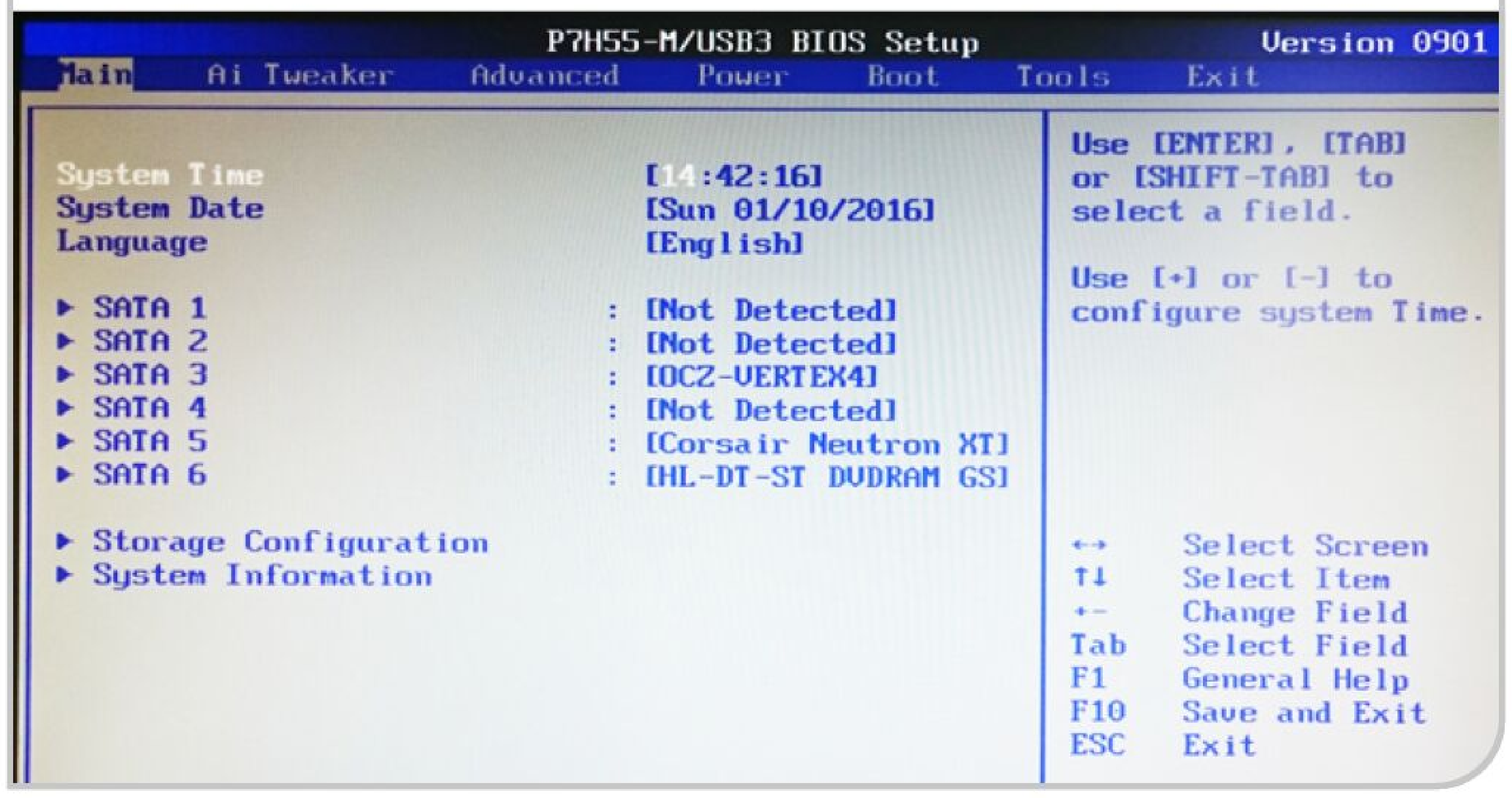
KEEP POWER CONNECTED |

If you're attempting to update the BIOS on a laptop, it's very important that you have it plugged in to the mains adapter, rather than running on the battery. If the battery runs out partway through the update process you could render your PC inoperable and end up with an expensive doorstop instead of a computer.

Flashing your BIOS using a built-in utility

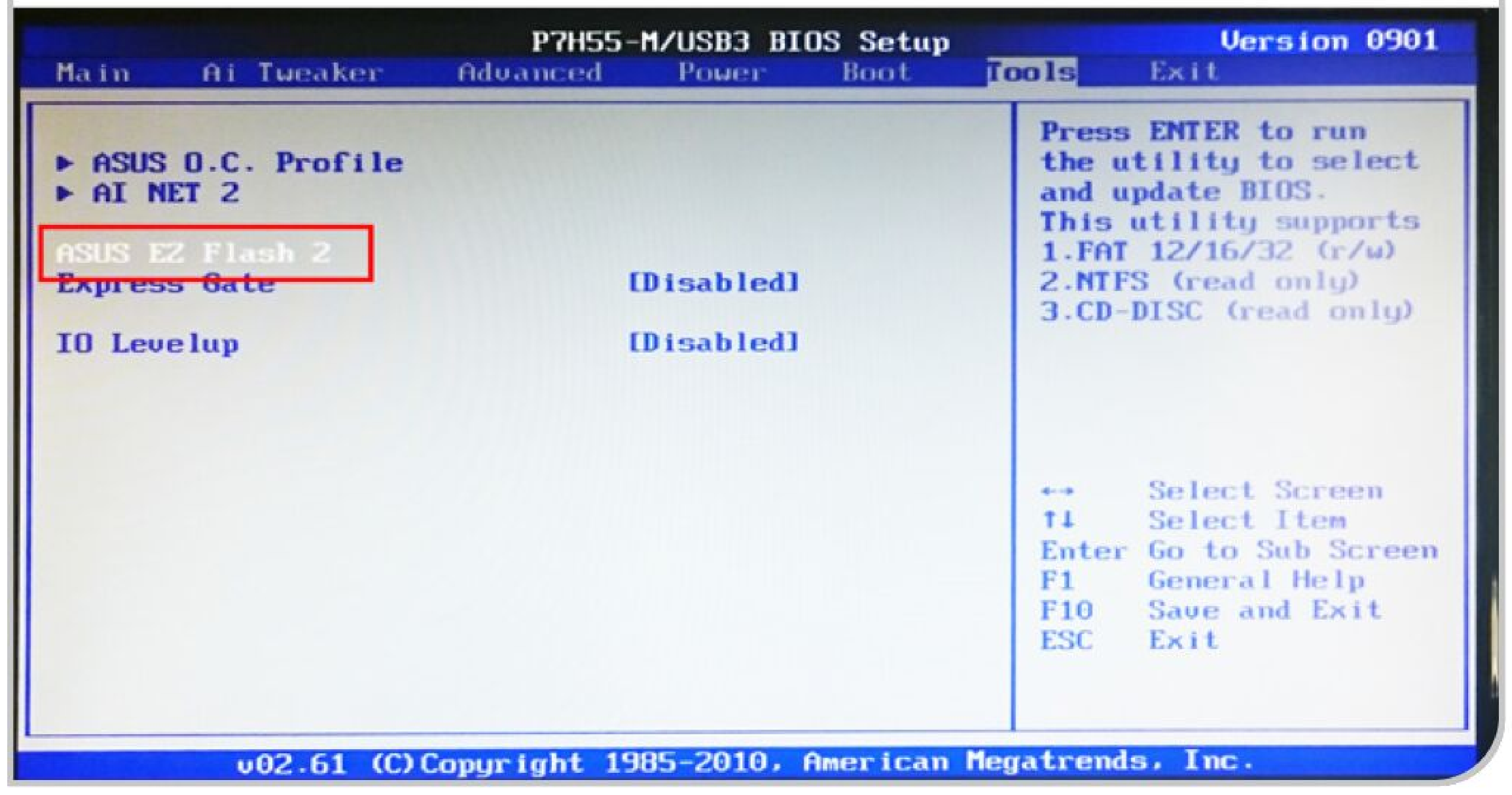
Now for the scary part, installing the new BIOS update. Make sure you've fully backed up your system before attempting this operation.

STEP 1 With the USB flash drive from the previous section still plugged in, restart your PC and enter the BIOS interface by pressing the key that you discovered in the first part of this tutorial.



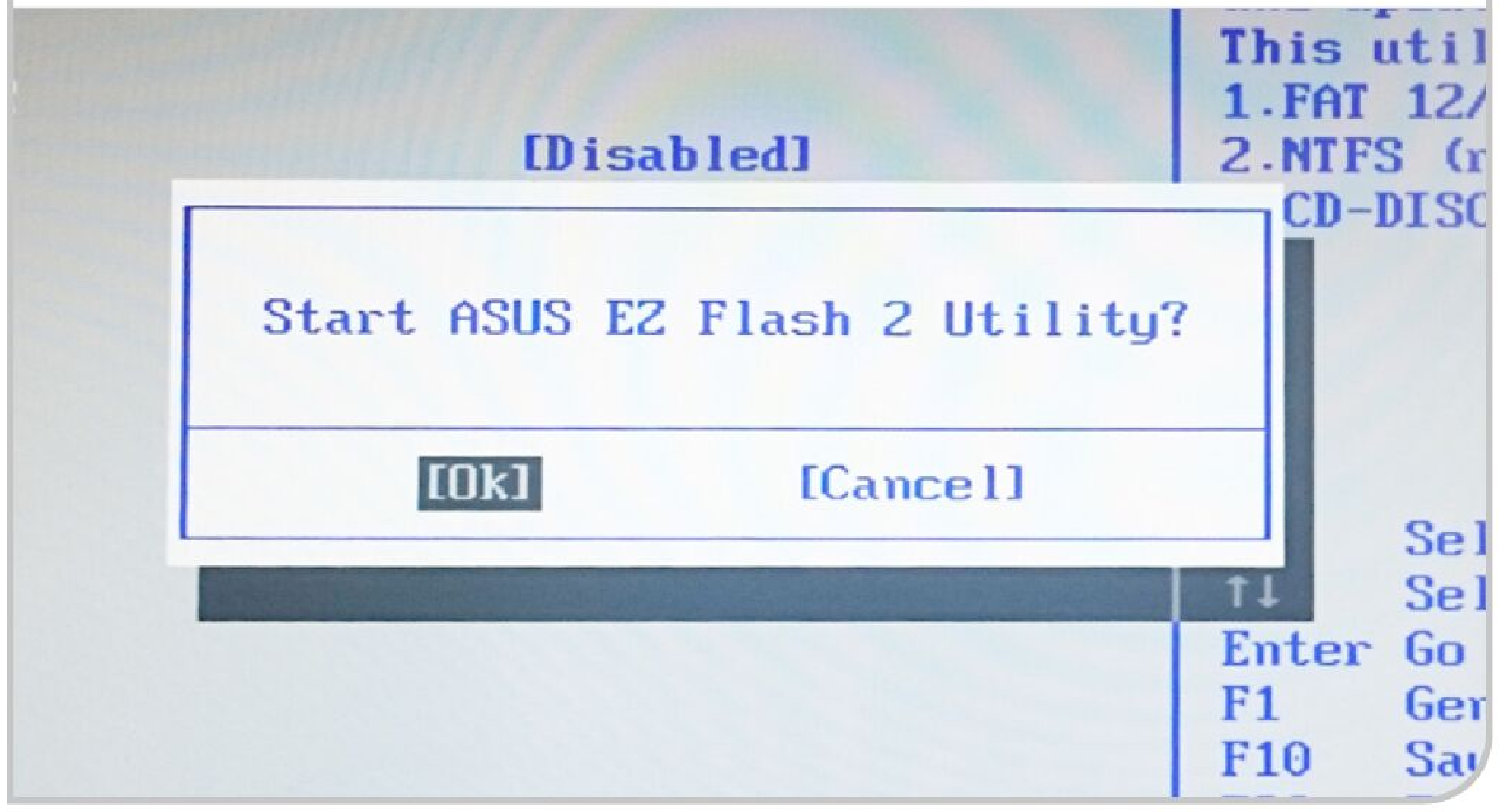
```
            P7H55-M/USB3 BIOS Setup                         Version 0901
Main    Ai Tweaker    Advanced    Power    Boot    Tools    Exit

System Time                    [14:42:16]                Use [ENTER], [TAB]
System Date                    [Sun 01/10/2016]          or [SHIFT-TAB] to
Language                       [English]                 select a field.

▶ SATA 1                     : [Not Detected]            Use [+] or [-] to
▶ SATA 2                     : [Not Detected]            configure system Time.
▶ SATA 3                     : [OCZ-VERTEX4]
▶ SATA 4                     : [Not Detected]
▶ SATA 5                     : [Corsair Neutron XT]
▶ SATA 6                     : [HL-DT-ST DVDRAM GS]

▶ Storage Configuration                                  ←→    Select Screen
▶ System Information                                     ↑↓    Select Item
                                                         +-    Change Field
                                                         Tab   Select Field
                                                         F1    General Help
                                                         F10   Save and Exit
                                                         ESC   Exit
```

STEP 2 Look at the main menu or the tabs across the top of the BIOS screen. If you see "Tools", navigate to it and you should find the BIOS update utility.



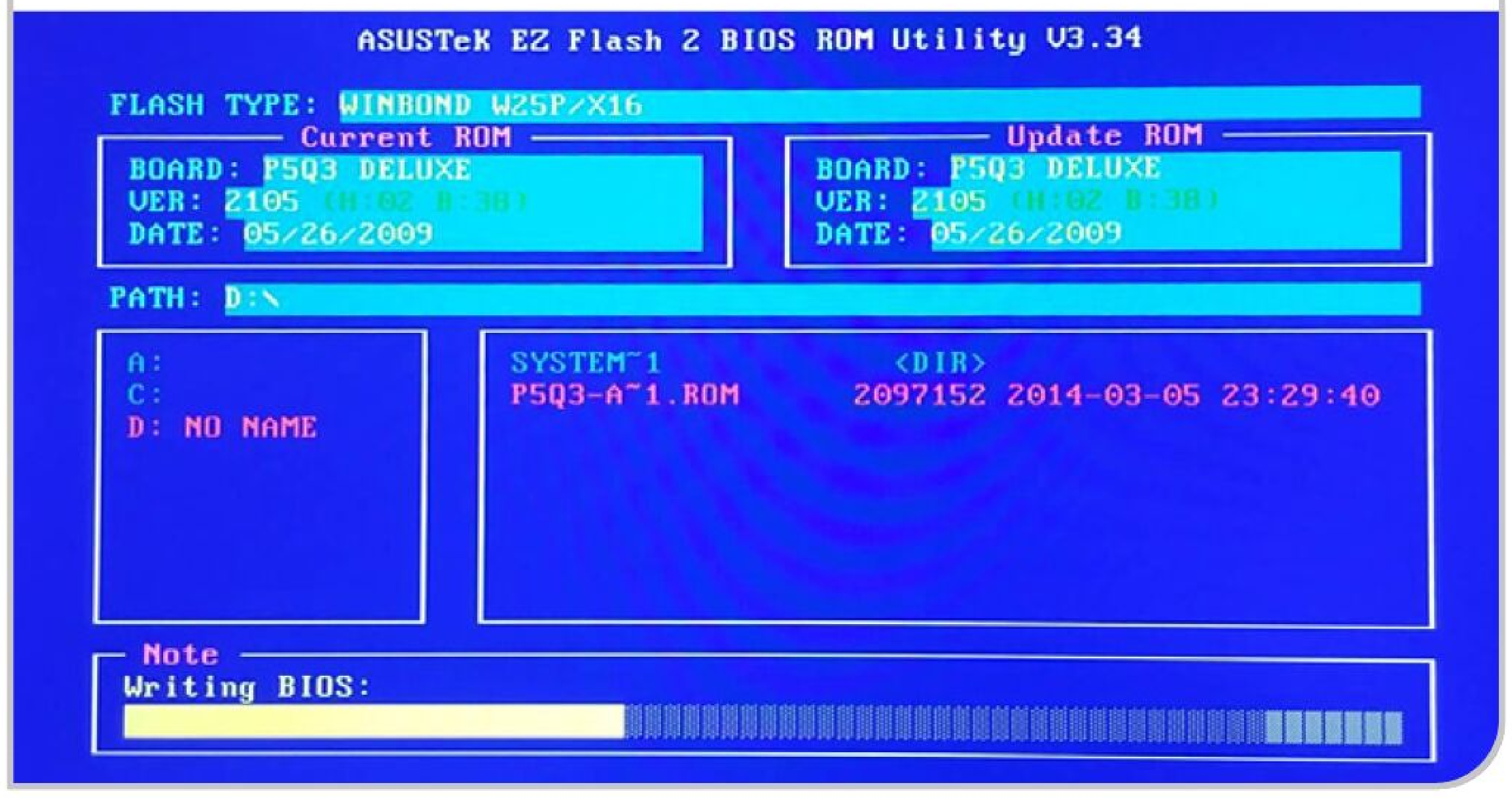
```
            P7H55-M/USB3 BIOS Setup                         Version 0901
Main    Ai Tweaker    Advanced    Power    Boot    Tools    Exit

▶ ASUS O.C. Profile                               Press ENTER to run
▶ AI NET 2                                        the utility to select
                                                  and update BIOS.
ASUS EZ Flash 2                                   This utility supports
Express Gate                  [Disabled]          1.FAT 12/16/32 (r/w)
                                                  2.NTFS (read only)
IO Levelup                    [Disabled]          3.CD-DISC (read only)

                                                  ←→     Select Screen
                                                  ↑↓     Select Item
                                                  Enter  Go to Sub Screen
                                                  F1     General Help
                                                  F10    Save and Exit
                                                  ESC    Exit

        v02.61 (C)Copyright 1985-2010, American Megatrends, Inc.
```

STEP 3 Using the arrow keys, move the cursor to highlight the BIOS flash utility and press enter. You'll see a confirmation message appear. Highlight OK and press Enter.



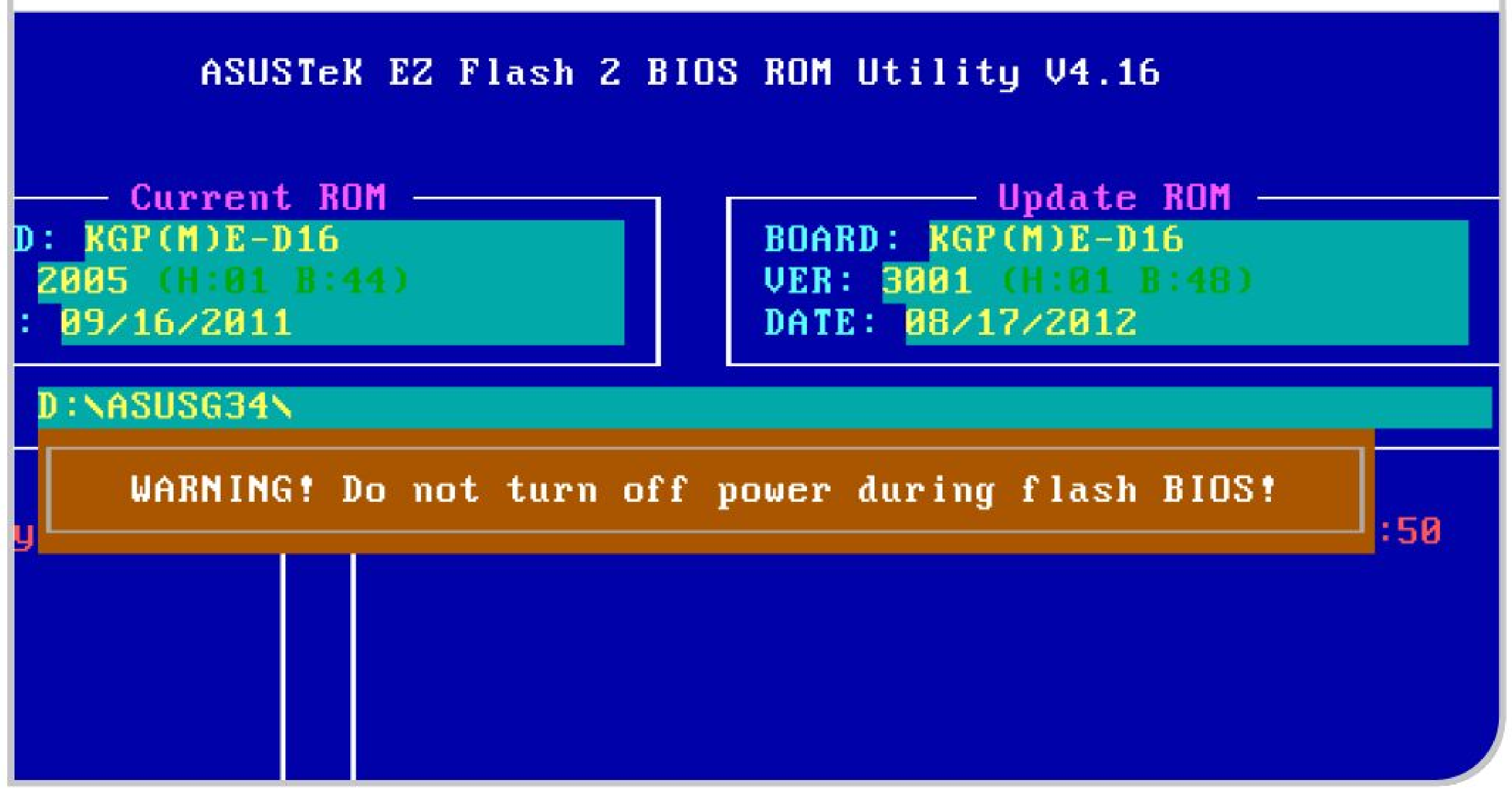
```
                                      This util
                                      1.FAT 12/
             [Disabled]               2.NTFS (r
                                        CD-DISC

   Start ASUS EZ Flash 2 Utility?

        [Ok]          [Cancel]
                                                Se
                                       ↑↓       Se
                                      Enter     Go
                                      F1        Ger
                                      F10       Sav
```

STEP 4 The update utility should recognise the USB flash drive that you have plugged in and it should find the BIOS update that you copied onto it. Highlight the update and press Enter.



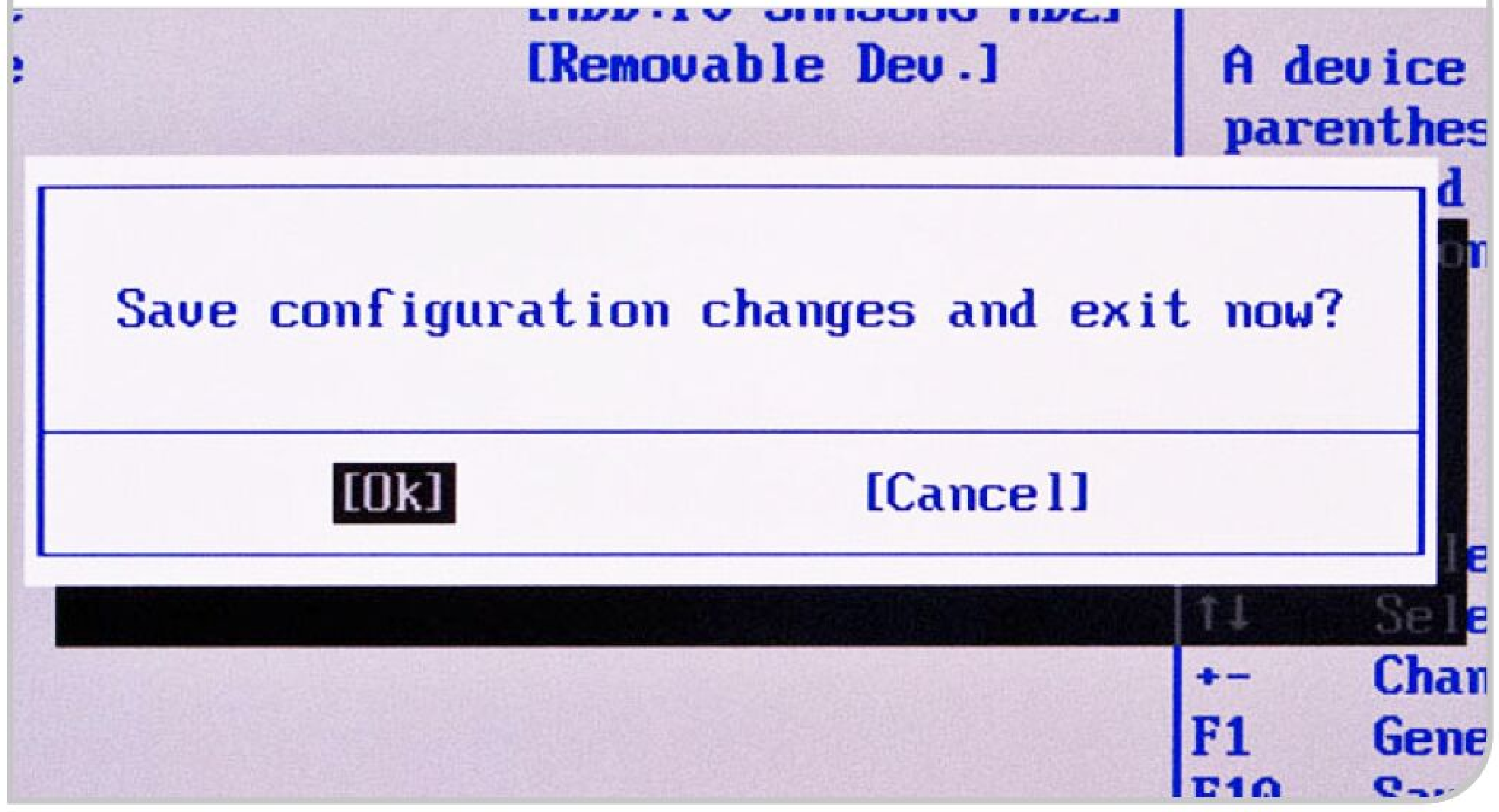
```
            ASUSTeK EZ Flash 2 BIOS ROM Utility V3.34

 FLASH TYPE: WINBOND W25P/X16
 ------ Current ROM ------          ------ Update ROM ------
 BOARD: P5Q3 DELUXE                 BOARD: P5Q3 DELUXE
 VER: 2105 (H:02 B:38)              VER: 2105 (H:02 B:38)
 DATE: 05/26/2009                   DATE: 05/26/2009
 PATH: D:\

 A:              SYSTEM~1              <DIR>
 C:              P5Q3-A~1.ROM     2097152 2014-03-05 23:29:40
 D: NO NAME

 Note
 Writing BIOS:
```

STEP 5 The BIOS update process will now proceed automatically. Once it's complete you will see that the BIOS version number has changed.



```
        ASUSTeK EZ Flash 2 BIOS ROM Utility V4.16

 ---- Current ROM ----              ---- Update ROM ----
D: KGP(M)E-D16                     BOARD: KGP(M)E-D16
 2005 (H:01 B:44)                   VER: 3001 (H:01 B:48)
: 09/16/2011                        DATE: 08/17/2012

 D:\ASUSG34\
    WARNING! Do not turn off power during flash BIOS!        :50
```

STEP 6 Press Exc or navigate to Exit, save changes and Exit the BIOS screen. Your PC will restart and Windows should now launch normally.



```
               [Removable Dev.]          A device
                                         parenthes

   Save configuration changes and exit now?

        [Ok]                [Cancel]

                                         ↑↓    Sele
                                         +-    Chan
                                         F1    Gene
```

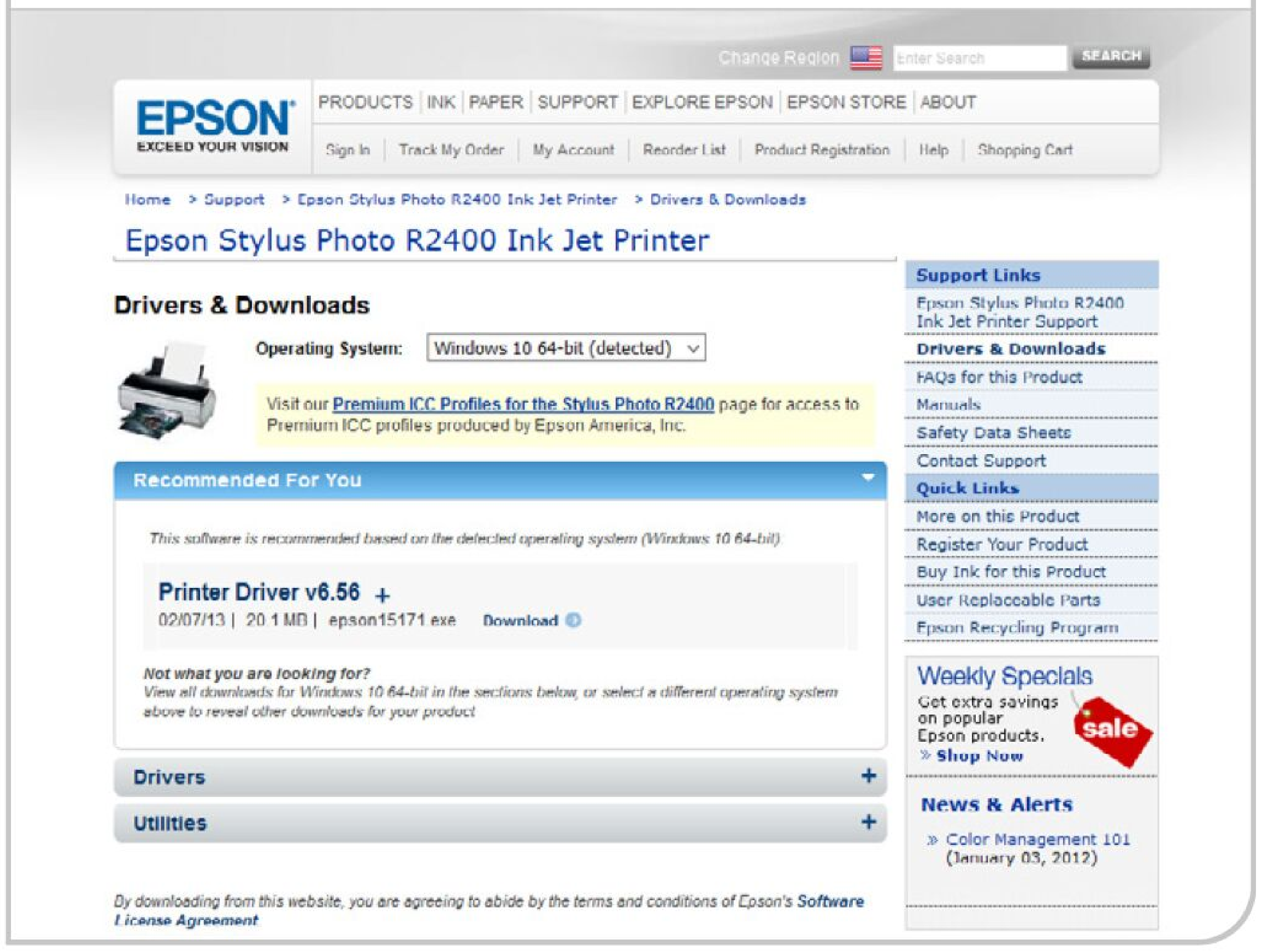
Updating Your Device Drivers

Keeping your device drivers up to date ensures optimum performance under Windows 10 and makes your whole system more stable and reliable. Device drivers are pieces of software that allow Windows to control and communicate with things like printers, digital cameras, games controllers and other peripheral devices that are plugged in to your system. Like all software they are under constant development and new versions are released to accommodate the latest operating systems.

Updating Drivers

Windows 10 comes with default generic drivers but for optimum performance it's a good idea to download and install the latest custom-made drivers for your hardware.

STEP 1 Go to the website of your peripheral manufacturer. In this case we're looking at the website for Epson printers, to install an update for an R2400 photo printer. Click on the link for product support and enter the model name or number.


Change Region
Enter Search
SEARCH
EPSON
EXCEED YOUR VISION
PRODUCTS | INK | PAPER | SUPPORT | EXPLORE EPSON | EPSON STORE | ABOUT
Sign In | Track My Order | My Account | Reorder List | Product Registration | Help | Shopping Cart
Home > Support > Epson Stylus Photo R2400 Ink Jet Printer > Drivers & Downloads

Epson Stylus Photo R2400 Ink Jet Printer

Drivers & Downloads

Operating System: Windows 10 64-bit (detected)

Visit our Premium ICC Profiles for the Stylus Photo R2400 page for access to Premium ICC profiles produced by Epson America, Inc.

Recommended For You

This software is recommended based on the detected operating system (Windows 10 64-bit)

Printer Driver v6.56 +
02/07/13 | 20.1 MB | epson15171.exe Download

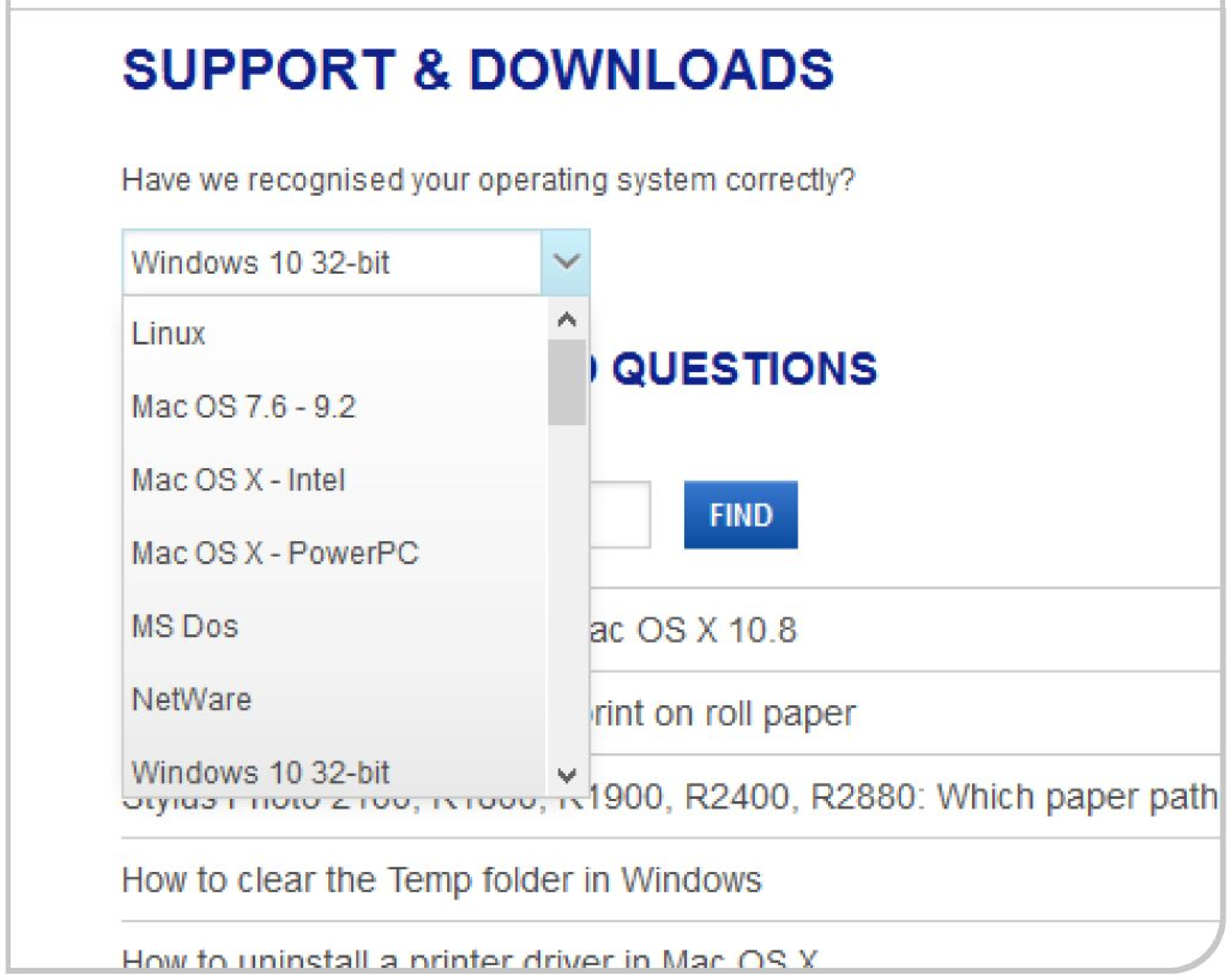
Not what you are looking for?
View all downloads for Windows 10 64-bit in the sections below, or select a different operating system above to reveal other downloads for your product

Drivers +
Utilities +

By downloading from this website, you are agreeing to abide by the terms and conditions of Epson's ***Software License Agreement***

Support Links
Epson Stylus Photo R2400 Ink Jet Printer Support
Drivers & Downloads
FAQs for this Product
Manuals
Safety Data Sheets
Contact Support
Quick Links
More on this Product
Register Your Product
Buy Ink for this Product
User Replaceable Parts
Epson Recycling Program
Weekly Specials
Get extra savings on popular Epson products.
» Shop Now
sale
News & Alerts
» Color Management 101 (January 03, 2012)

STEP 2 Epson's website, for example, can automatically detect the operating system you're using and immediately offer you the latest recommended driver. In other cases you will have to tell the site that you're using Windows 10.


SUPPORT & DOWNLOADS

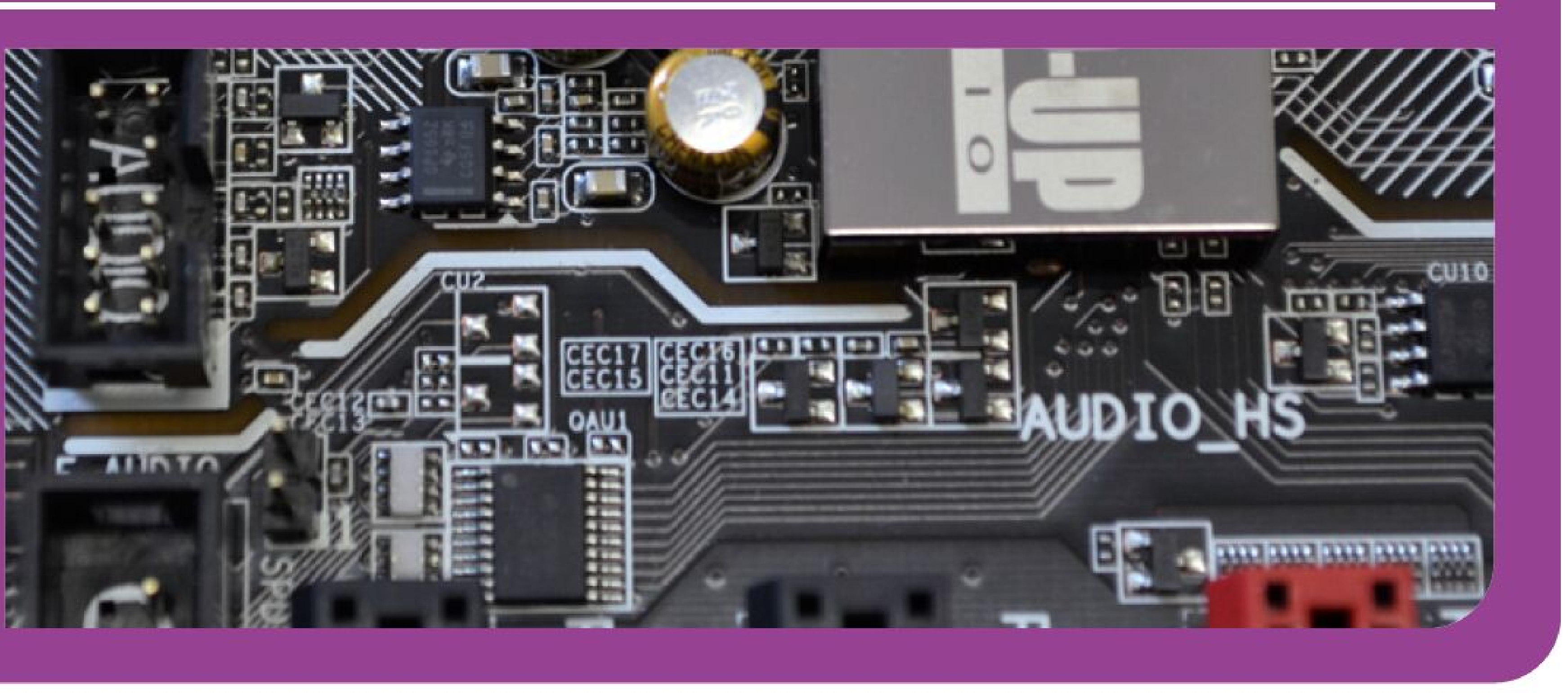
Have we recognised your operating system correctly?

Windows 10 32-bit

Linux
Mac OS 7.6 - 9.2
Mac OS X - Intel
Mac OS X - PowerPC
MS Dos
NetWare
Windows 10 32-bit
QUESTIONS
FIND
ac OS X 10.8
rint on roll paper
1900, R2400, R2880: Which paper path
How to clear the Temp folder in Windows
How to uninstall a printer driver in Mac OS X

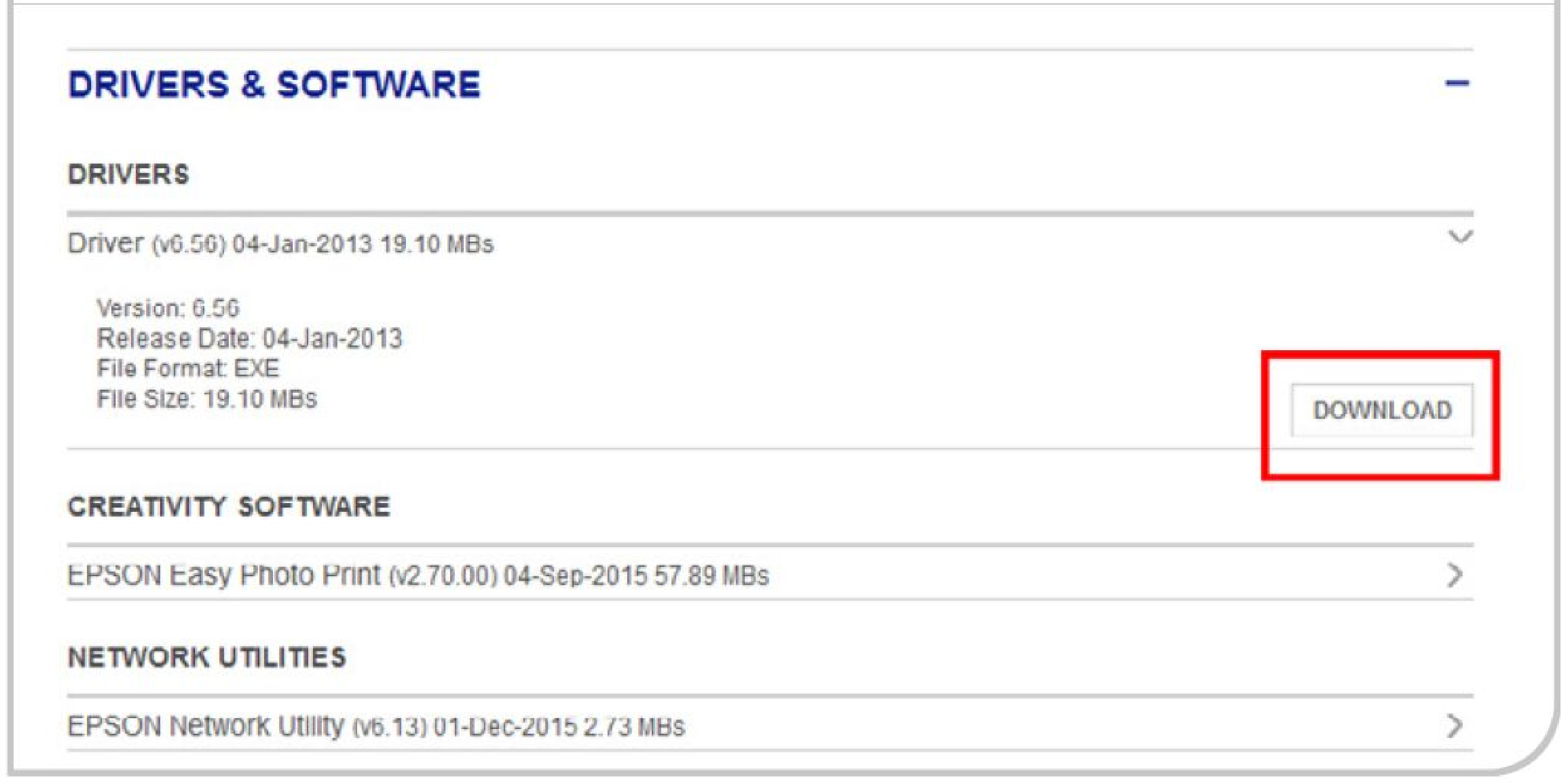
DEVICE FIRMWARE

It is easy to get device drivers and firmware confused as they work in different ways. In electronic systems and computing, firmware is a type of software that provides control, monitoring and data manipulation of engineered products and systems. Typical examples of devices containing firmware are embedded systems such as consumer appliances, remote controls, digital watches, computers, computer peripherals, mobile phones and digital cameras. Firmware provides low-level control for these devices.


AUDIO_HS
CU10

STEP 3

Once you've entered the model name and told the site that you're looking for Windows 10 drivers, you should be offered a link to download the latest driver. Click on the link and download the driver file to your desktop.



DRIVERS & SOFTWARE

DRIVERS

Driver (v6.56) 04-Jan-2013 19.10 MBs

Version: 6.56
Release Date: 04-Jan-2013
File Format: EXE
File Size: 19.10 MBs

DOWNLOAD

CREATIVITY SOFTWARE

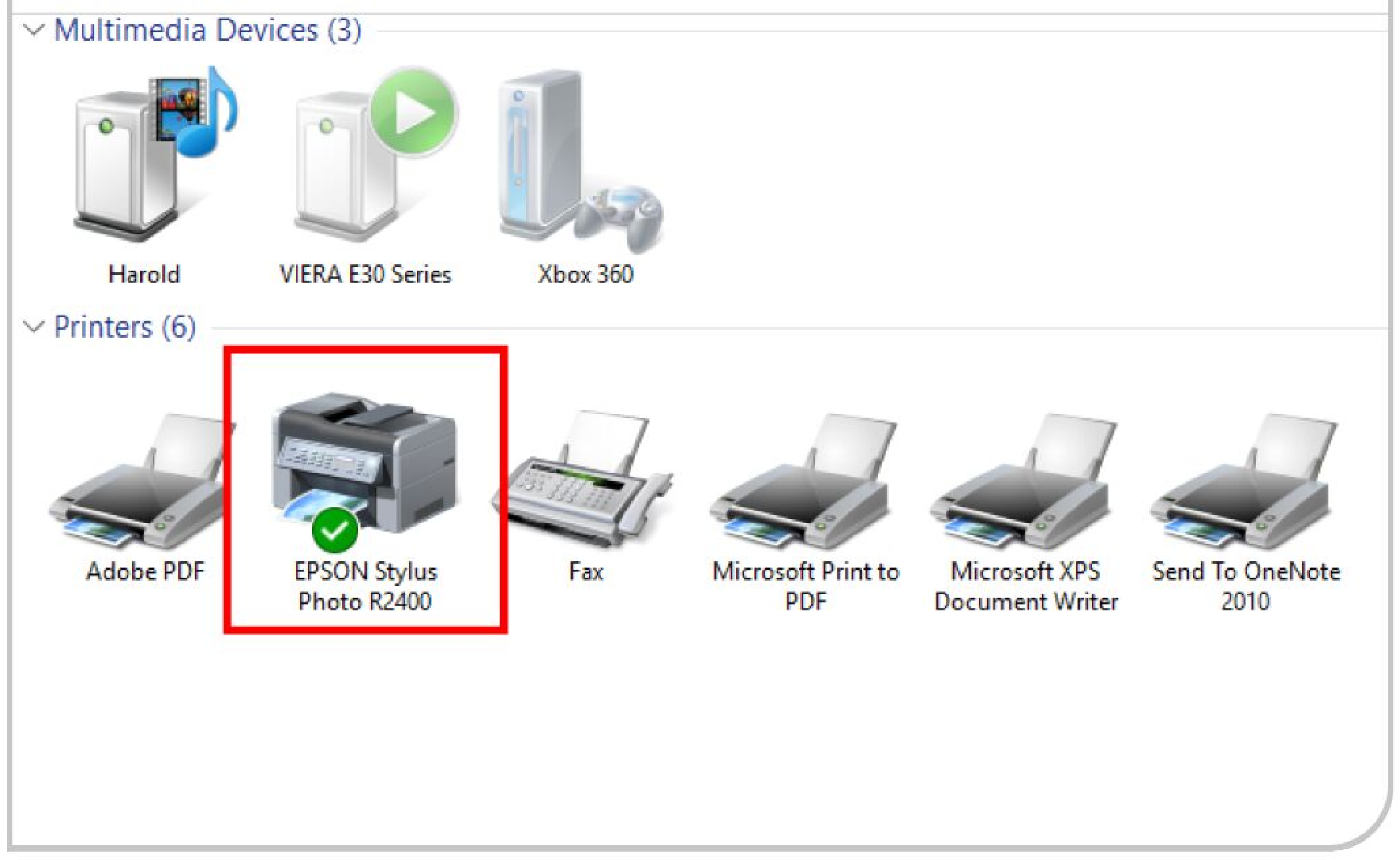
EPSON Easy Photo Print (v2.70.00) 04-Sep-2015 57.89 MBs

NETWORK UTILITIES

EPSON Network Utility (v6.13) 01-Dec-2015 2.73 MBs

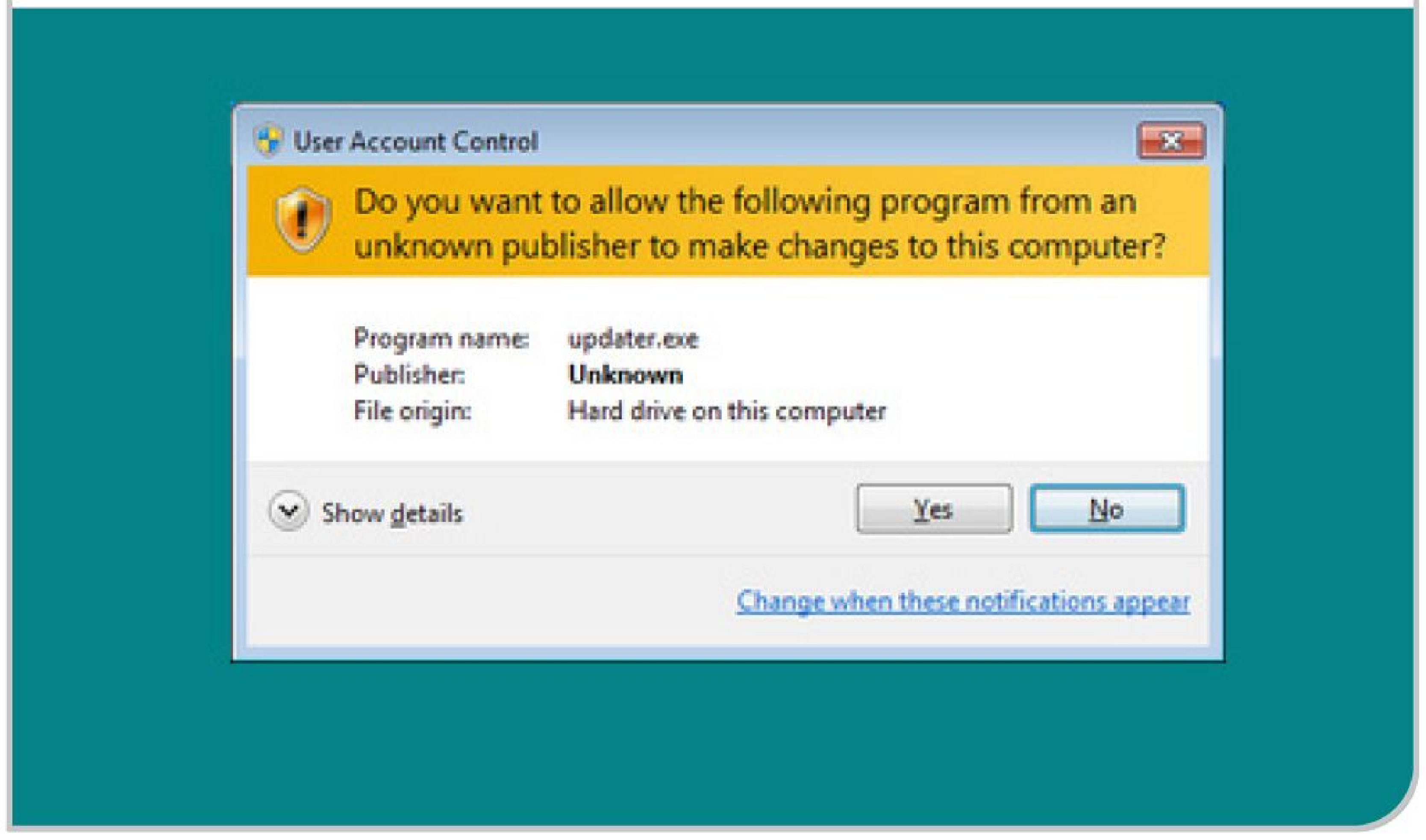
STEP 4

If you're installing a driver for a device that has to be plugged in and switched on in order to work, such as a printer, make sure that the device is connected and powered up before proceeding.


Multimedia Devices (3)
Harold
VIERA E30 Series
Xbox 360
Printers (6)
Adobe PDF
EPSON Stylus Photo R2400
Fax
Microsoft Print to PDF
Microsoft XPS Document Writer
Send To OneNote 2010

STEP 5

Once the driver download is complete, go to your desktop and locate the newly downloaded file. Double-click on it to begin installation. You'll see a message from Windows asking if you want to proceed with software installation. Click OK to proceed.



User Account Control

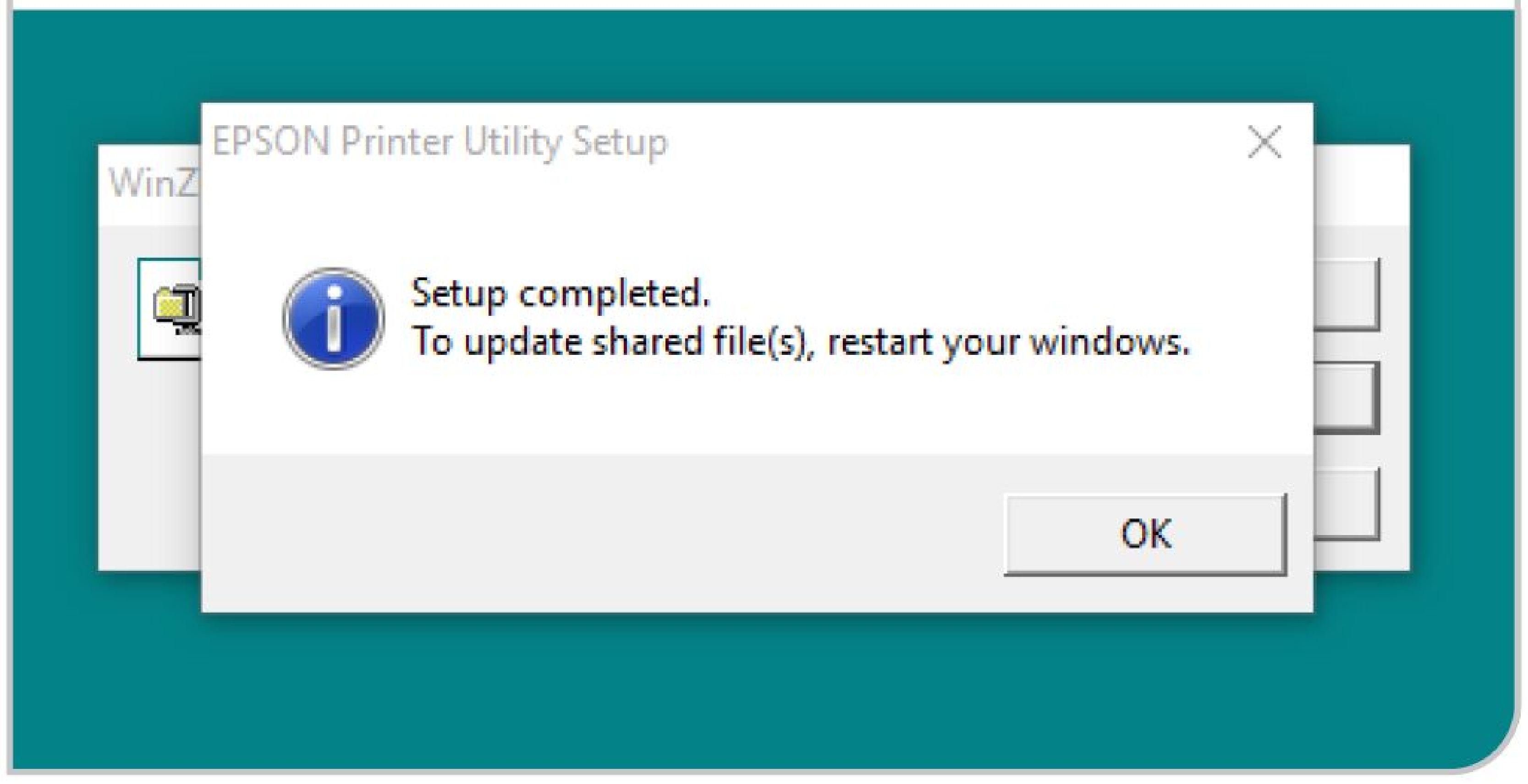
Do you want to allow the following program from an unknown publisher to make changes to this computer?

Program name: updater.exe
Publisher: **Unknown**
File origin: Hard drive on this computer

Show details
Yes
No
Change when these notifications appear

STEP 6

From here on the process is mostly just clicking OK on a series of windows. Do check that the device driver you're installing matches the device connected to your PC. The driver installation should only take a few seconds.

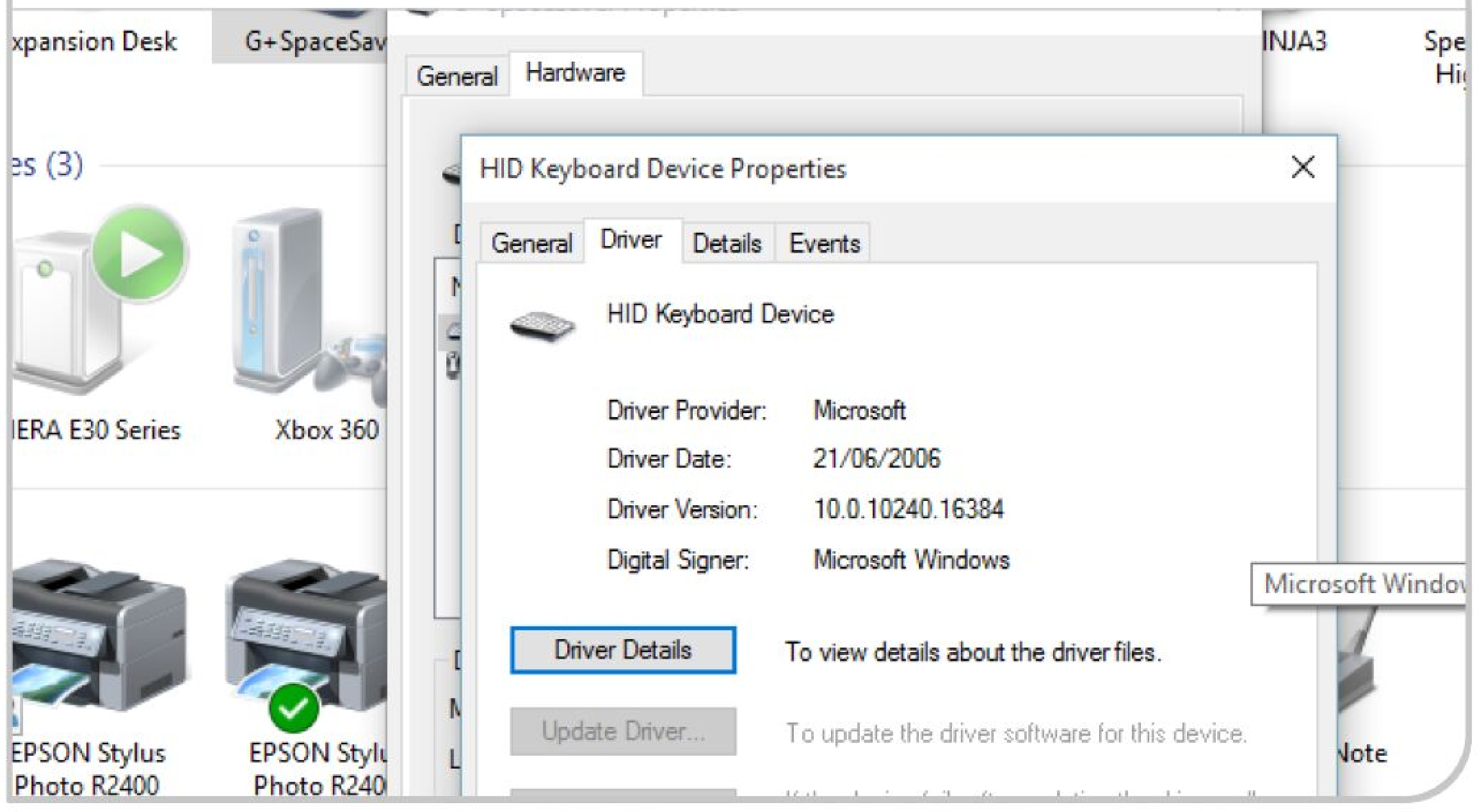


EPSON Printer Utility Setup

Setup completed.
To update shared file(s), restart your windows.

STEP 7

When it's complete you'll receive a notification telling you that the installation was successful. Repeat this process for any other peripherals that are connected to your system. You don't need to restart between installations for different types of devices.



HID Keyboard Device Properties

HID Keyboard Device

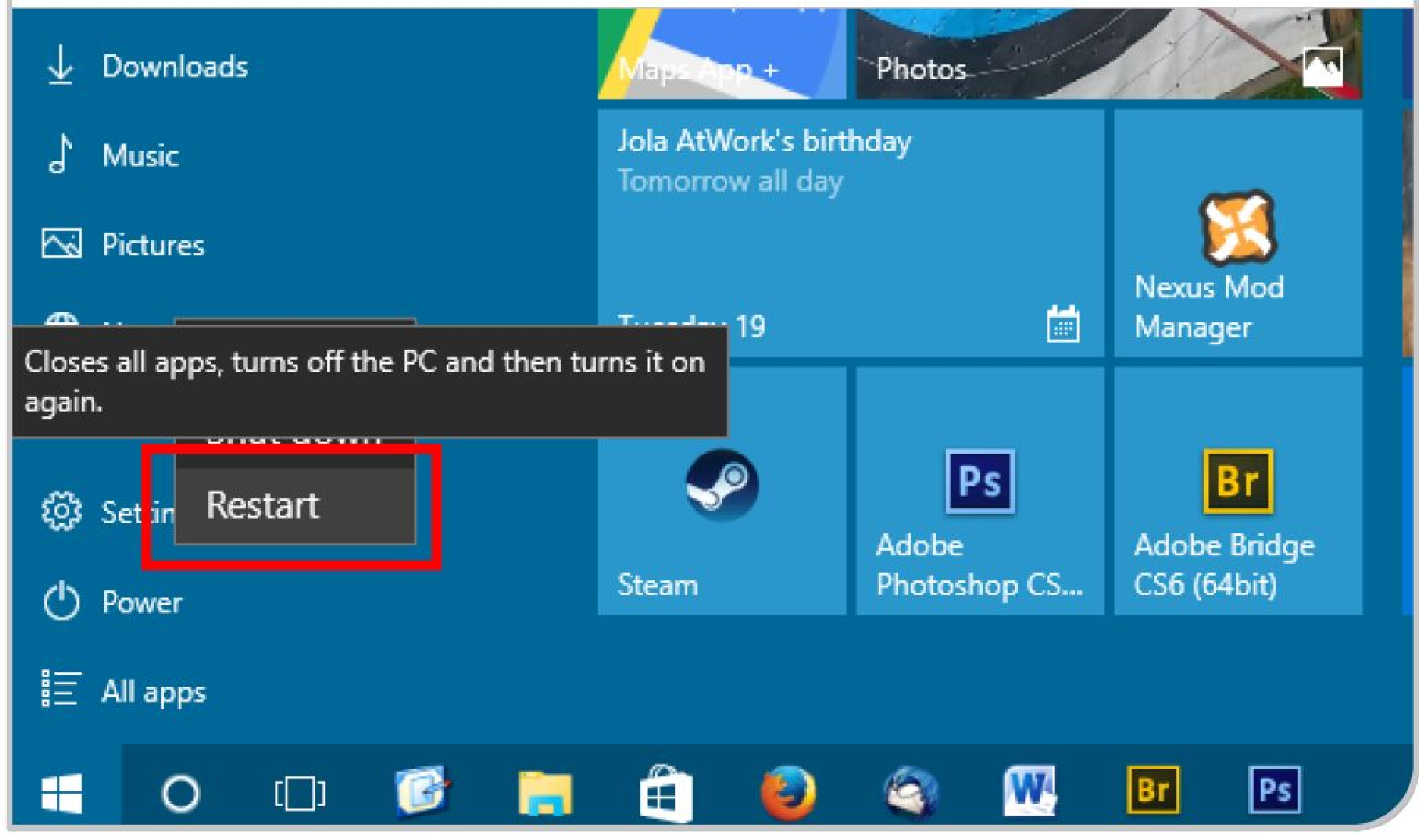
Driver Provider: Microsoft
Driver Date: 21/06/2006
Driver Version: 10.0.10240.16384
Digital Signer: Microsoft Windows

Driver Details — To view details about the driver files.
Update Driver... — To update the driver software for this device.

General
Hardware
General
Driver
Details
Events
VIERA E30 Series
Xbox 360
EPSON Stylus Photo R2400

STEP 8

Once you've finished updating your drivers it's a good idea to restart your machine, since this should clear out any temporary files created during the installation process, as well as finalising the deletion of any old drivers.



Closes all apps, turns off the PC and then turns it on again.

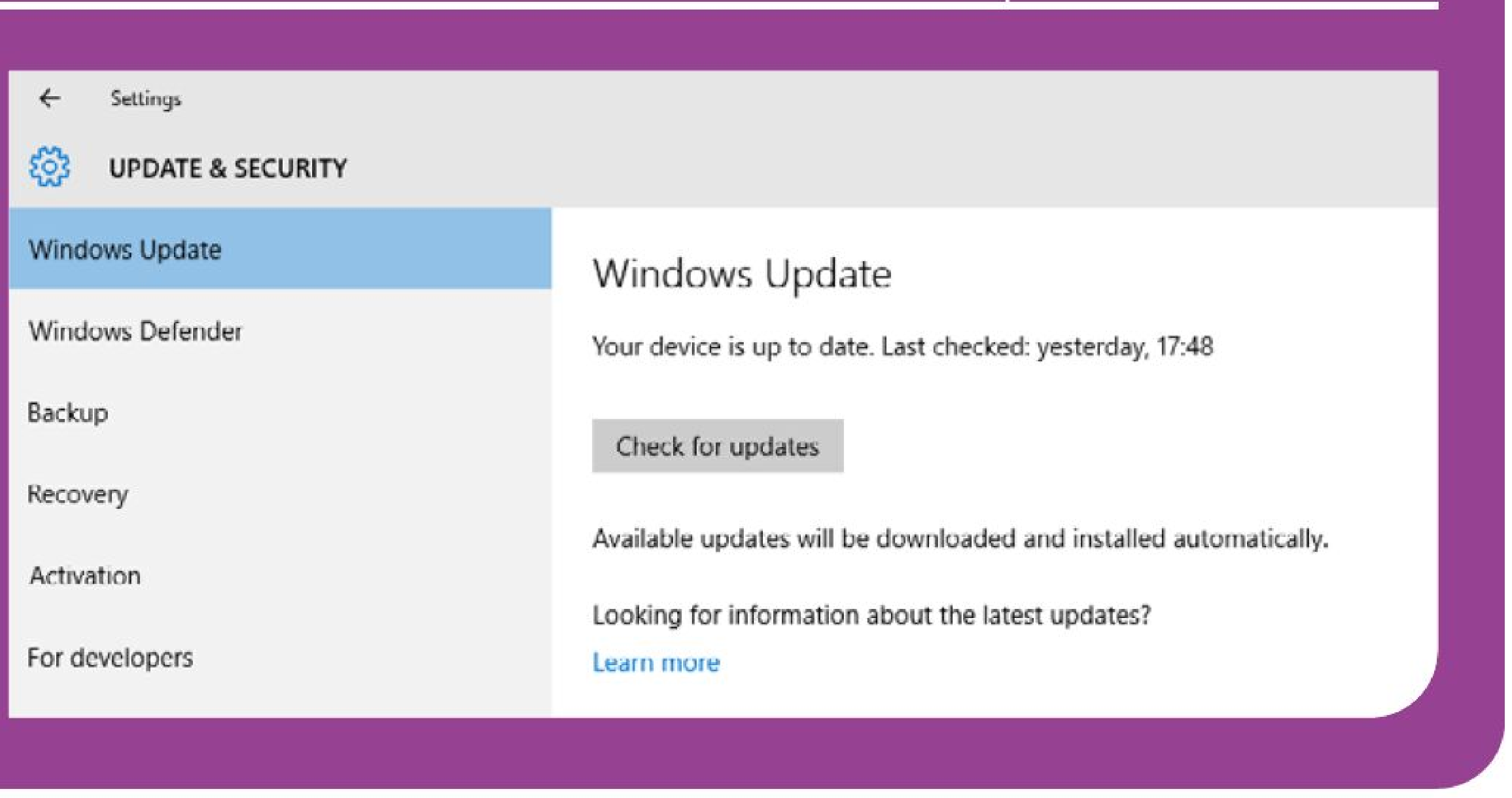
Downloads
Music
Pictures
Restart
Power
All apps
Maps App +
Photos
Jola AtWork's birthday
Tomorrow all day
19
Nexus Mod Manager
Steam
Adobe Photoshop CS...
Adobe Bridge CS6 (64bit)

Optimising Your PC for Performance

There are many ways to improve the performance of your PC. Some will only produce marginal improvements and some only speed up operations such as web searches. However, when you're trying to squeeze the most out of your system every little helps; here are some more handy tips to boost the performance of your system even further.

MAKE SURE YOU INSTALL THE LATEST WINDOWS UPDATES |

Microsoft normally releases important updates on the second Tuesday of every month, although important updates will be released immediately. You should check for and install available Windows Updates, which could include: bug fixes, security patches, Windows Defender malware definitions etc. These could help keep your system stable and improve the performance of Windows.


Settings
UPDATE & SECURITY
Windows Update
Windows Defender
Backup
Recovery
Activation
For developers
Windows Update
Check for updates
Learn more

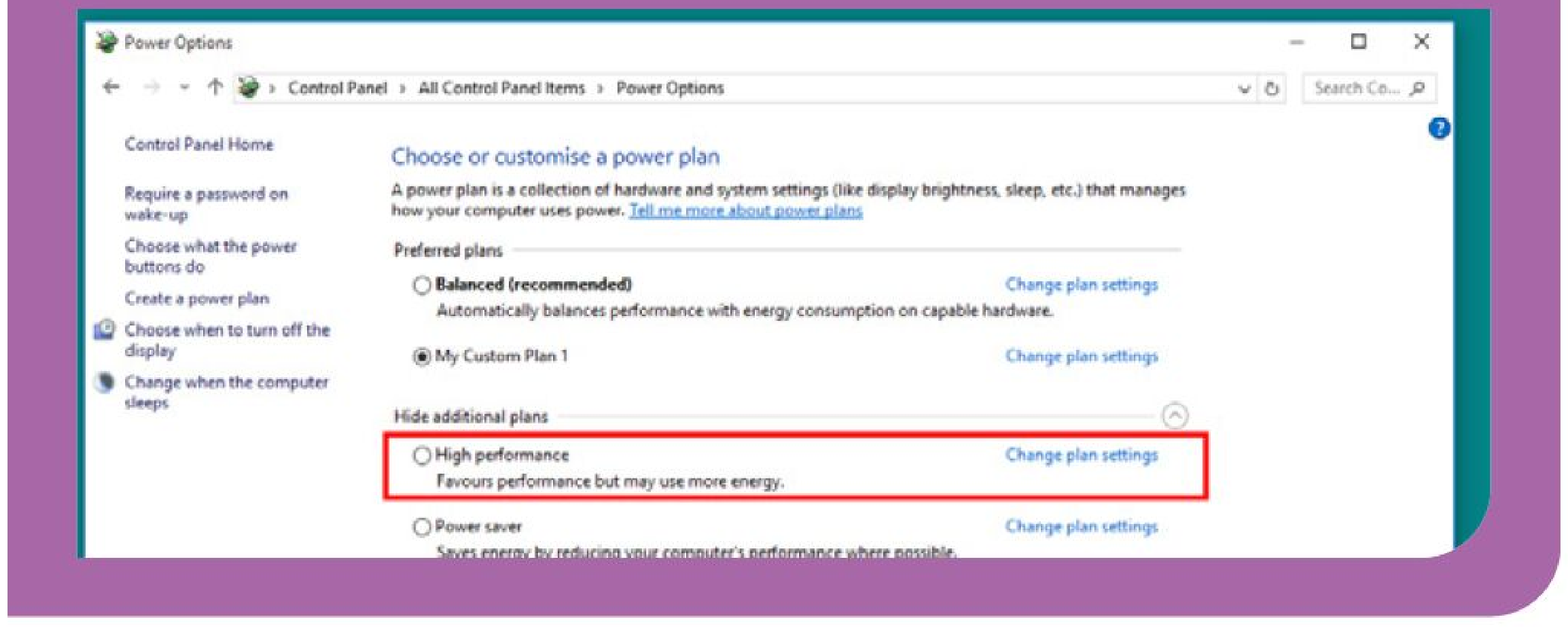
Your device is up to date. Last checked: yesterday, 17:48

Available updates will be downloaded and installed automatically.

Looking for information about the latest updates?

USE THE HIGH PERFORMANCE POWER PLAN |

You'll find this in the Power Options section of the Control Panel; just click on "Show additional plans". By default your PC is set to use the Balanced power option that will reduce power to non-essential components when they're not being used. By selecting the High Performance plan your PC will use more power but will be running at peak performance all the time. Note however that some laptops and tablets may run very hot under this power setting. If you notice this happening, immediately switch back to the Balanced power plan.


Power Options
Control Panel › All Control Panel Items › Power Options
Search Co...
Control Panel Home
Require a password on wake-up
Choose what the power buttons do
Create a power plan
Choose when to turn off the display
Change when the computer sleeps
Choose or customise a power plan
Tell me more about power plans
Preferred plans
Change plan settings
Change plan settings
Hide additional plans
Change plan settings
Change plan settings

A power plan is a collection of hardware and system settings (like display brightness, sleep, etc.) that manages how your computer uses power.

○ **Balanced (recommended)**
Automatically balances performance with energy consumption on capable hardware.

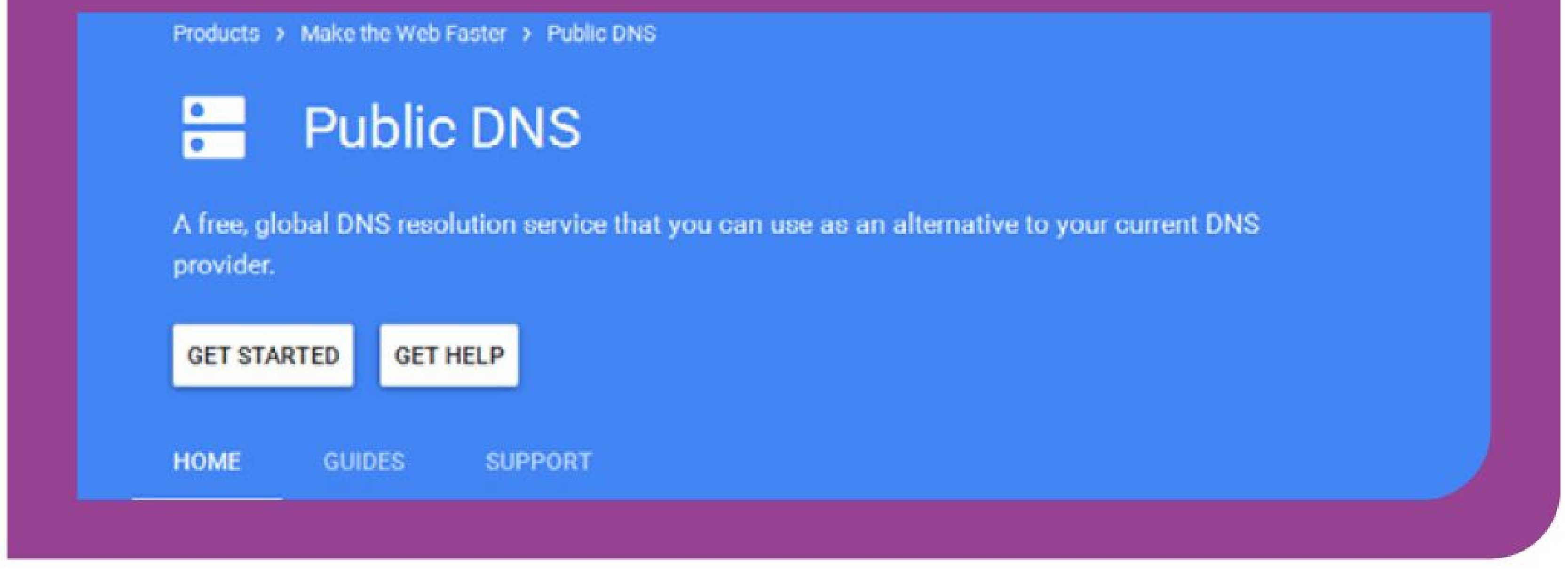
● My Custom Plan 1

○ High performance
Favours performance but may use more energy.

○ Power saver
Saves energy by reducing your computer's performance where possible.

SWITCH TO A FASTER DNS SERVER |

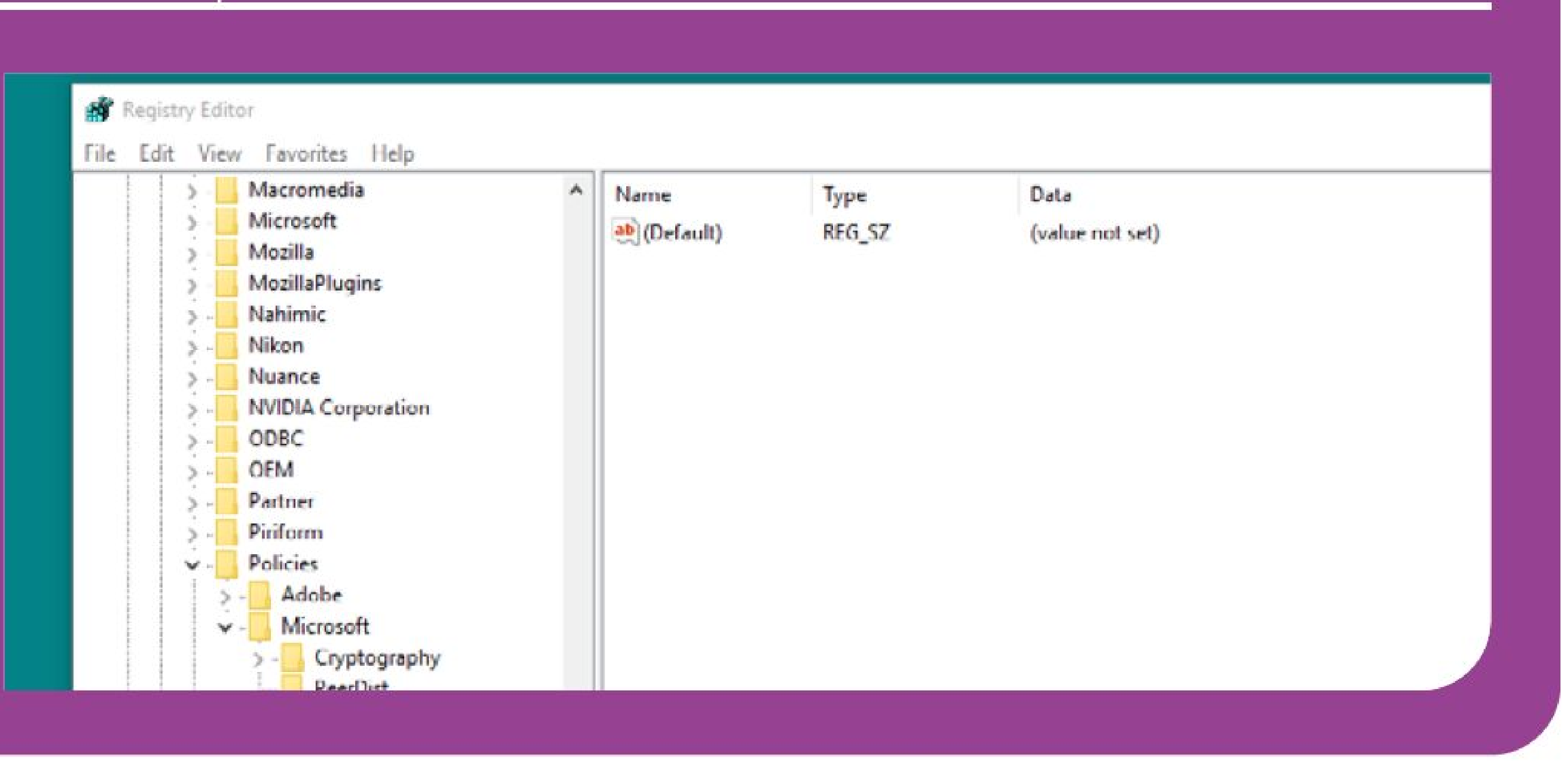
Most ISPs will boast about how much bandwidth they are giving you but the speed of your connection isn't the only thing that makes for a fast web browsing experience. If your ISP doesn't maintain its Domain Name Server (DNS) properly it will slow down your web searches and make connecting to websites slow and unreliable. In fact slow and poorly maintained DNS servers are one of the main causes of problems connecting to websites. You might consider adding or using a fast DNS server like Google Public DNS as your primary DNS server in your TCP/IP settings to see how it compares to your ISP.


Products › Make the Web Faster › Public DNS
Public DNS
GET STARTED
GET HELP
HOME
GUIDES
SUPPORT

A free, global DNS resolution service that you can use as an alternative to your current DNS provider.

SPEED UP WINDOWS SHUT DOWN TIME |

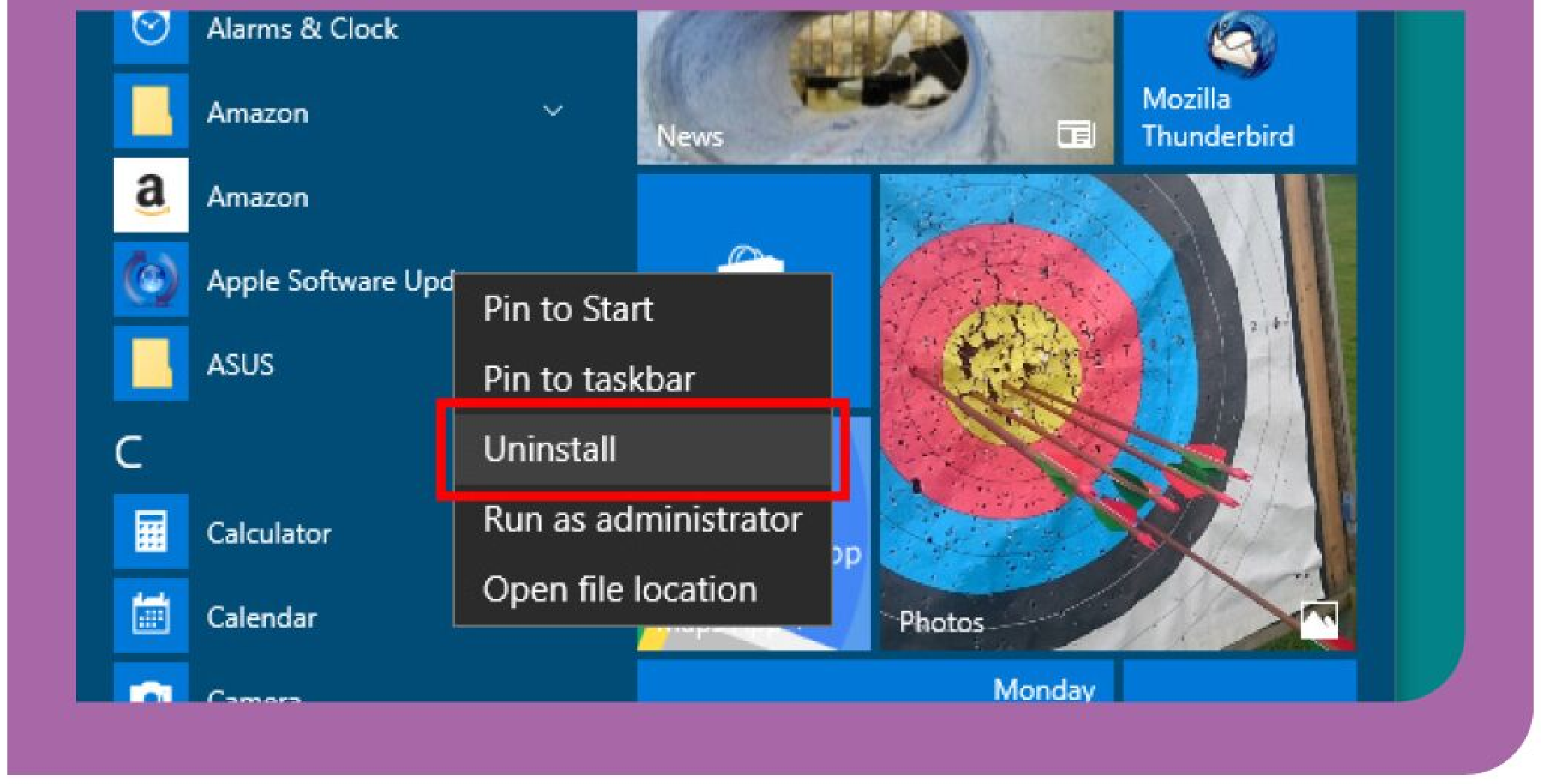
If you don't mind mucking about in the system registry, you can set and adjust the AutoEndTasks, HungAppTimeout, WaitToKillAppTimeout, and WaitToKillServiceTimeout values. These control how long Windows waits for hung programs to close and other programs to save data and close before shutting down. Do note however that the registry is very complex and making changes can have a catastrophic effect on your PC. Only try this if you know what you're doing. We will look at registry editing in more detail in a future issue of this book.


Registry Editor
File Edit View Favorites Help
Macromedia
Microsoft
Mozilla
MozillaPlugins
Nahimic
Nikon
Nuance
NVIDIA Corporation
ODBC
OEM
Partner
Piriform
Policies
Adobe
Microsoft
Cryptography

Name	Type	Data
(Default)	REG_SZ	(value not set)

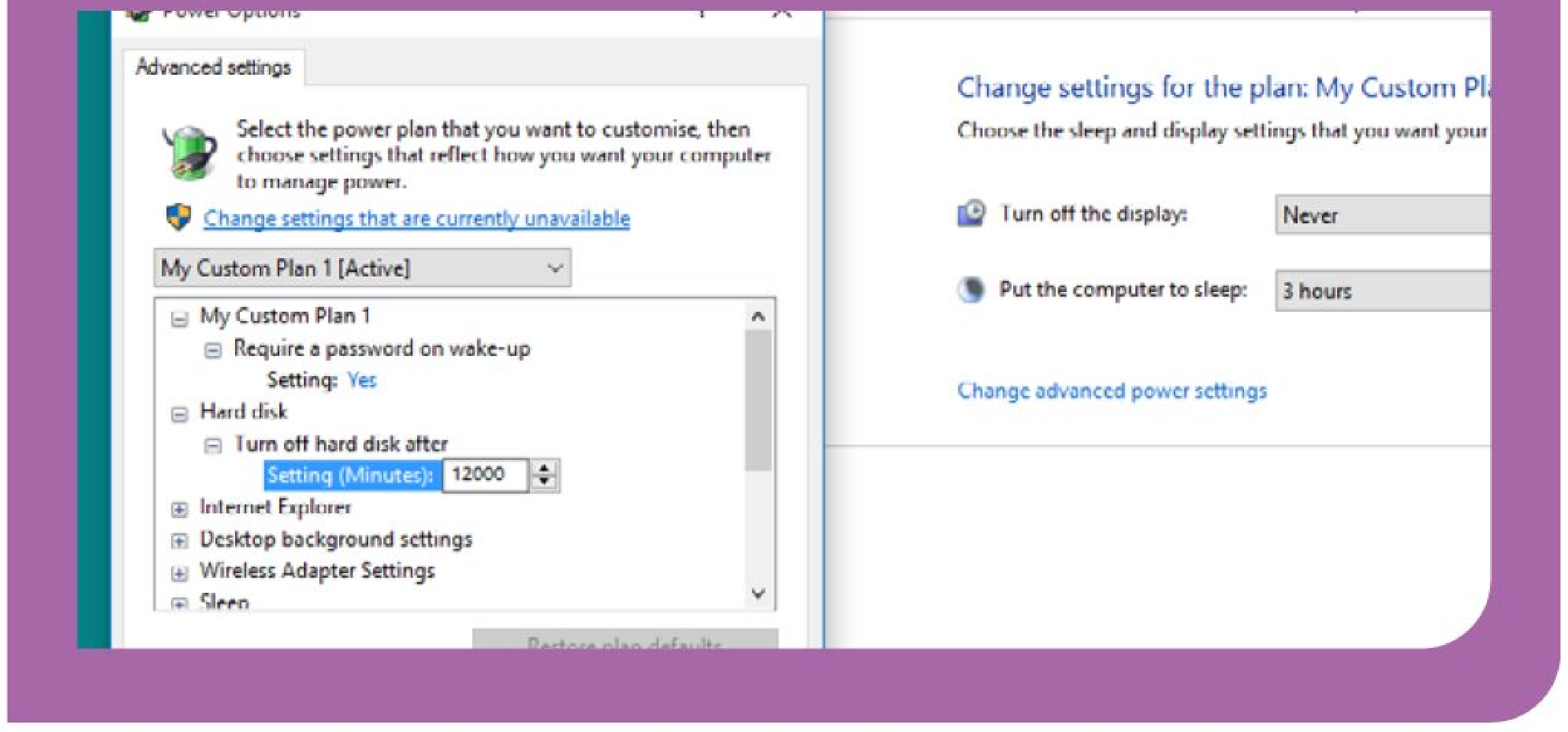
UNINSTALL REDUNDANT PROGRAMS |

If you've got apps or games installed on your system that you just don't use anymore, it's a good idea to uninstall them. This is particularly true with off the shelf PCs that often come with a lot of useless software preinstalled. Fortunately Windows 10 makes this easy, since you can uninstall apps from the Start menu by right-clicking on them and choosing Uninstall from the pop-up menu.


Alarms & Clock
Amazon
Amazon
Apple Software Upd
ASUS
C
Calculator
Calendar
News
Mozilla Thunderbird
Photos
Monday
Pin to Start
Pin to taskbar
Uninstall
Run as administrator
Open file location

SET "TURN OFF HARD DISK AFTER" TO NEVER |

While having your HDDs turn off after a set amount of idle minutes will help save energy, it can also cause your PC to slow down significantly while it waits for the HDD to spin back up when it's needed again. If you go to the Power Options section of the Control Panel you can adjust the idle time to never, or just increase the amount of minutes. Alternatively you could install an SSD, which is always at full readiness. See our tutorial on page 12.


Power Options
Advanced settings
Change settings that are currently unavailable
Internet Explorer
Desktop background settings
Wireless Adapter Settings
Sleep
Restore plan defaults
Change advanced power settings

Select the power plan that you want to customise, then choose settings that reflect how you want your computer to manage power.

My Custom Plan 1 [Active]

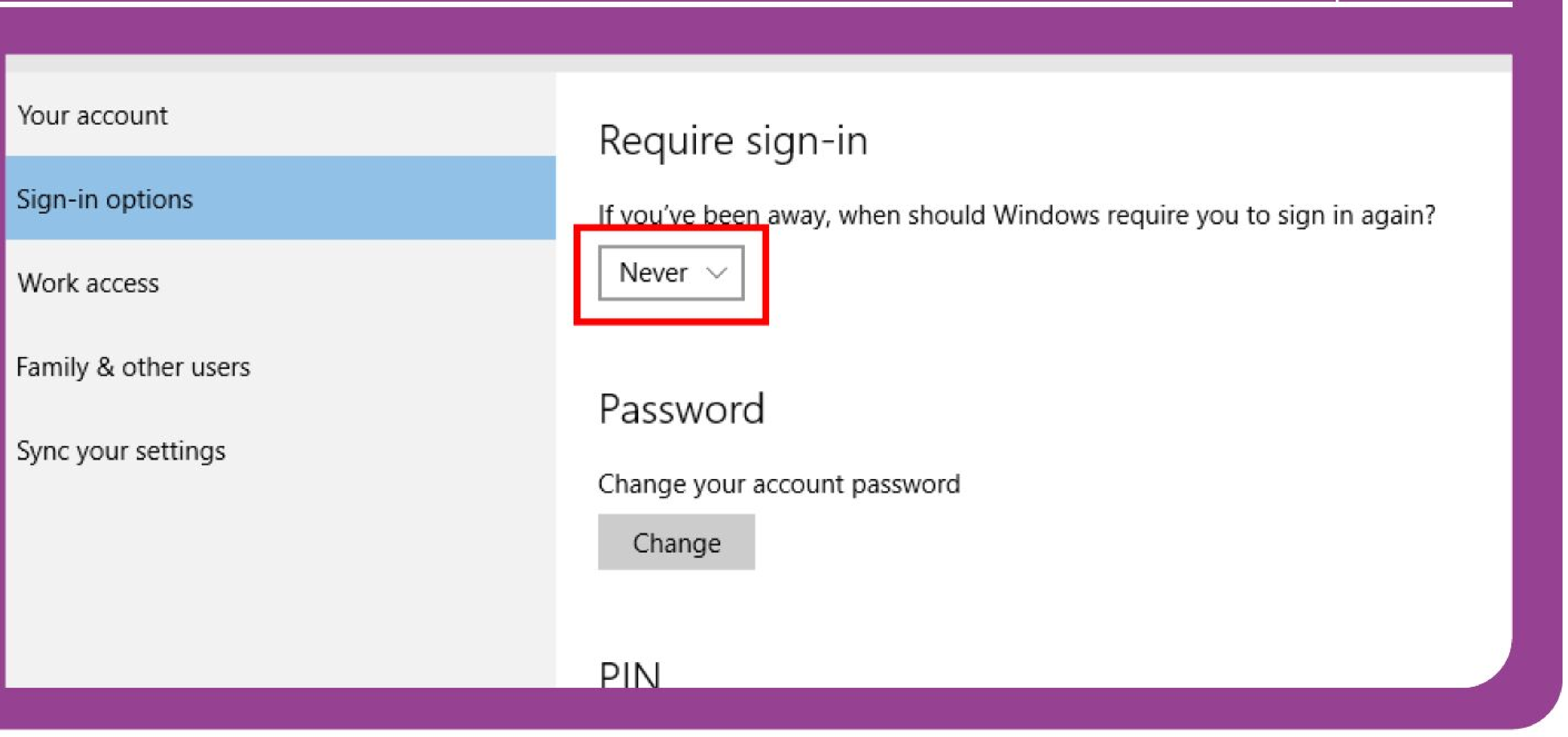
My Custom Plan 1
Require a password on wake-up
Setting: Yes
Hard disk
Turn off hard disk after
Setting (Minutes): 12000

Change settings for the plan: My Custom Pl
Choose the sleep and display settings that you want your

Turn off the display: Never
Put the computer to sleep: 3 hours

AUTOMATICALLY SIGN IN TO YOUR USER ACCOUNT AT STARTUP |

This is really not recommended for any computer to which others may have access but if you're definitely the only person that will use your PC, you might want to set it so that you don't have to sign in whenever your computer wakes from sleep mode. You can do this in the Accounts > Sign-in options section of the Settings page. Note however that this will allow anyone who gets access to your PC to access your personal account. Do so at your own risk.


Your account
Sign-in options
Work access
Family & other users
Sync your settings
Change
PIN

Require sign-in

If you've been away, when should Windows require you to sign in again?

Never

Password

Change your account password

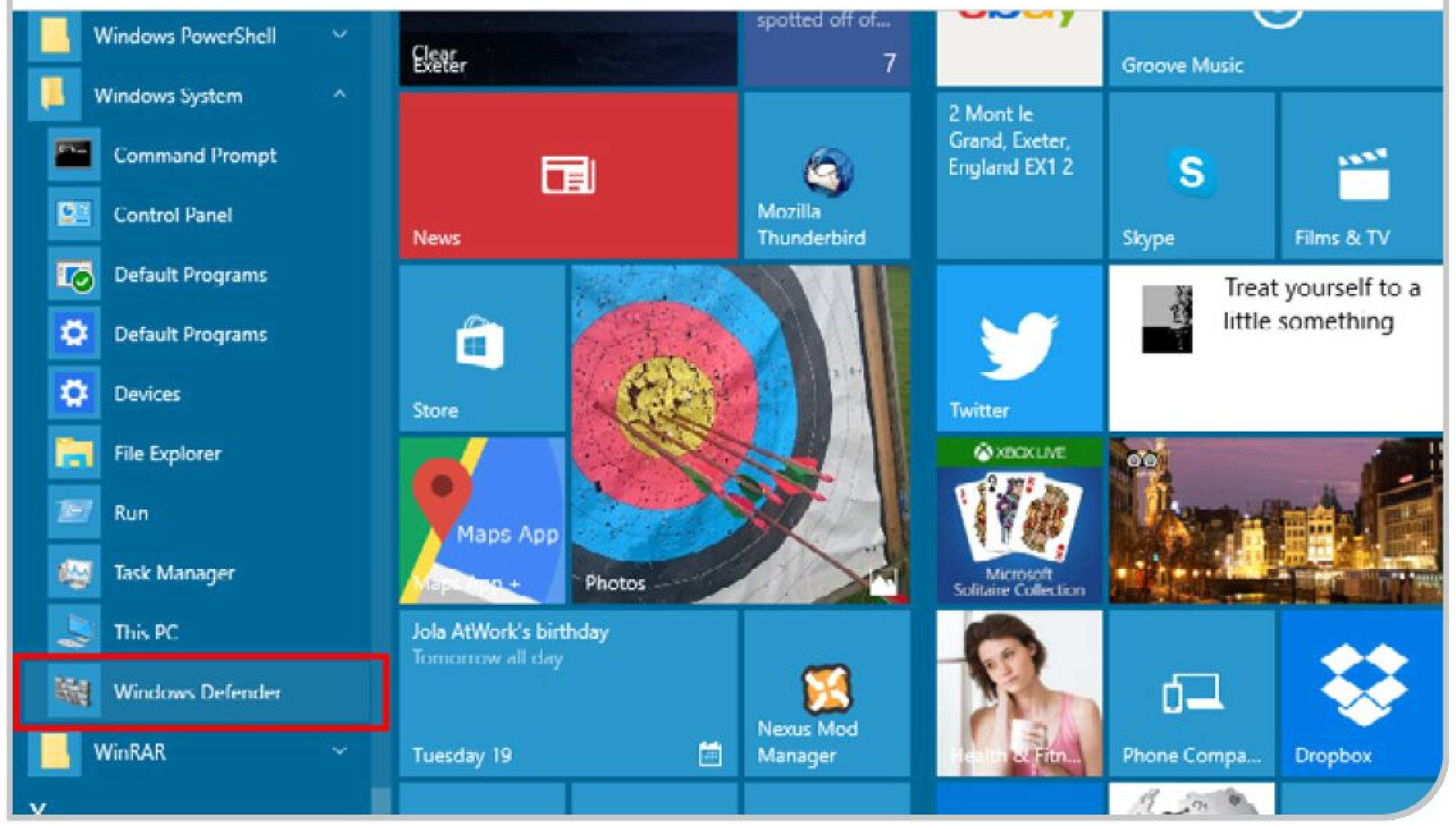
Protecting Your PC from Malware

Malware is the collective term for destructive and disruptive software created with the specific intention of stealing private information about you, stealing your money or simply damaging your computer. It includes computer viruses that can attack and take over your system, browser add-ons that display pop-up ads, key loggers that can record everything you type on your keyboard and spyware that can steal your personal information. Here's how to get rid of them.

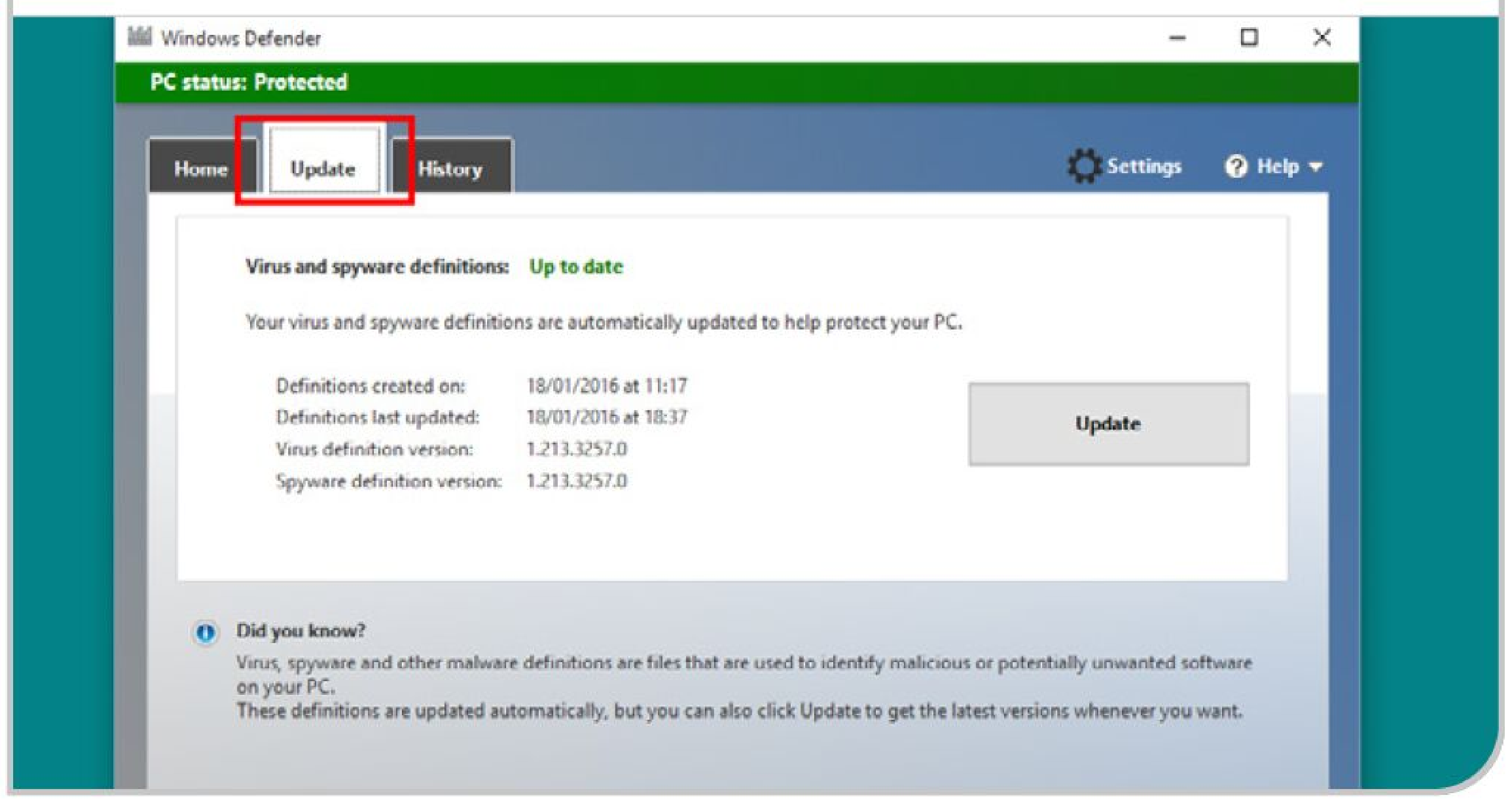
Scanning for malware using Windows Defender

Windows Defender is the built-in security software that comes preinstalled with Windows 10. Use it to scan for malware on your system.

STEP 1 To find Windows Defender, open the Start menu, click on All Apps and scroll right down to the bottom. You'll find it in Windows System. Click the menu link to open it.


Windows PowerShell
Windows System
Command Prompt
Control Panel
Default Programs
Default Programs
Devices
File Explorer
Run
Task Manager
This PC
Windows Defender
WinRAR
News
Mozilla Thunderbird
2 Mont le Grand, Exeter, England EX1 2
Skype
Films & TV
Groove Music
Store
Twitter
Treat yourself to a little something
Maps App
Photos
XBOX LIVE
Microsoft Solitaire Collection
Jola AtWork's birthday
Tomorrow all day
Tuesday 19
Nexus Mod Manager
Phone Compa...
Dropbox

STEP 2 PC security software works by recognising the signatures of known malware and there are new signatures being recognised all the time. Before scanning your system it's important to ensure that your virus signatures are up to date, so click on the Update tab.


Windows Defender
Home
Update
History
Settings
Help
Update

PC status: Protected

Virus and spyware definitions: Up to date

Your virus and spyware definitions are automatically updated to help protect your PC.

Definitions created on: 18/01/2016 at 11:17
Definitions last updated: 18/01/2016 at 18:37
Virus definition version: 1.213.3257.0
Spyware definition version: 1.213.3257.0

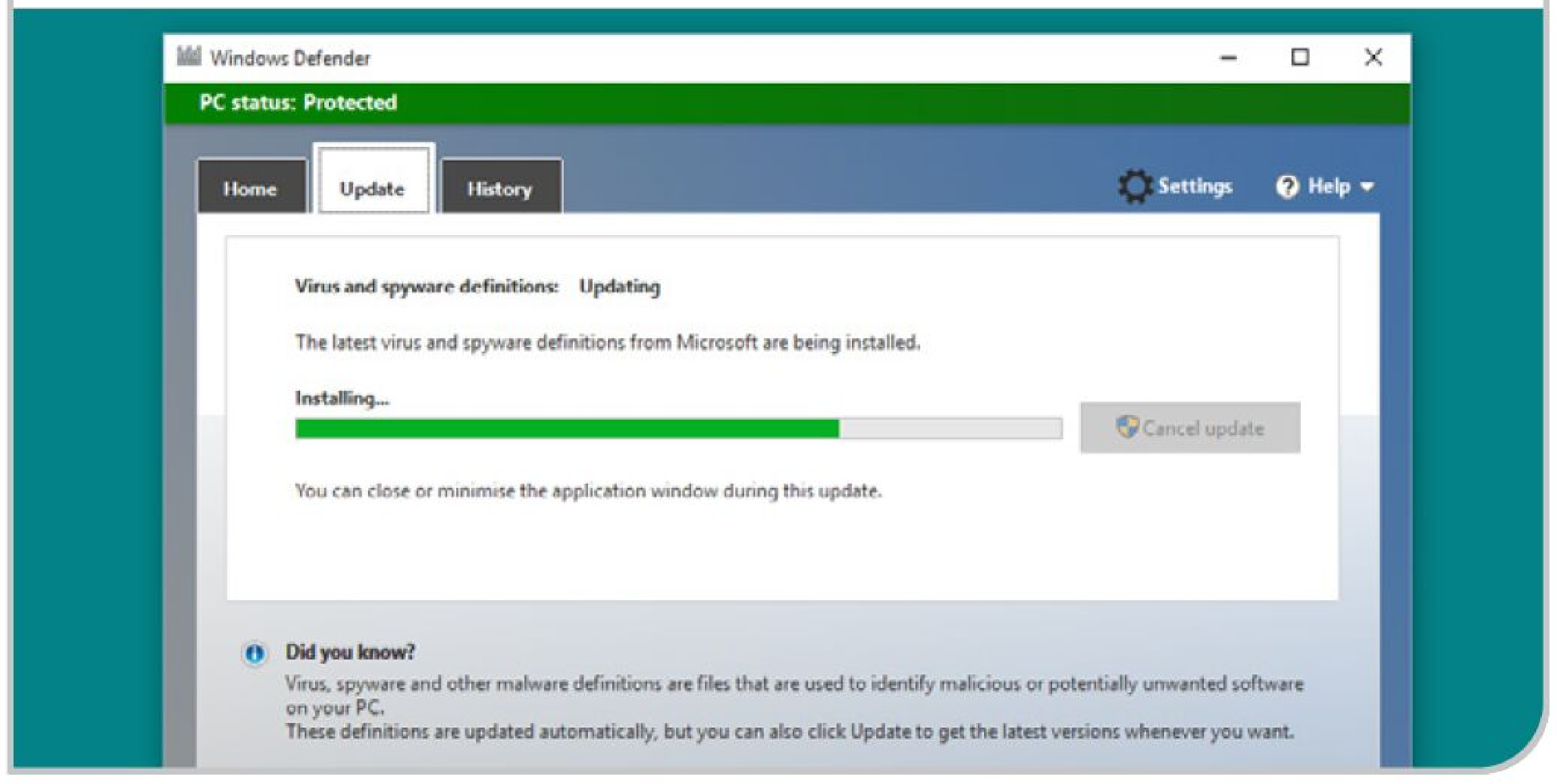
Did you know?
Virus, spyware and other malware definitions are files that are used to identify malicious or potentially unwanted software on your PC.
These definitions are updated automatically, but you can also click Update to get the latest versions whenever you want.

WINDOWS DEFENDER ALTERNATIVE

Windows Defender is very good at stopping basic threats and will keep your system safe as long as you keep it updated and scan regularly but the better commercial apps offer more advanced features such as automatic scanning of incoming emails, blocking websites that contain malware and the ability to automatically schedule regular system scans. For the highest level of system security we would recommend a good subscription based security suite such as Kaspersky Internet Security.

KASPERSKY lab
Internet Security

STEP 3 Click on the "Update definitions" button. If your PC has been switched off for an extended period, you may have to wait for a few seconds while Defender connects to the server and downloads the latest malware signatures.



PC status: Protected

Virus and spyware definitions: Updating

The latest virus and spyware definitions from Microsoft are being installed.

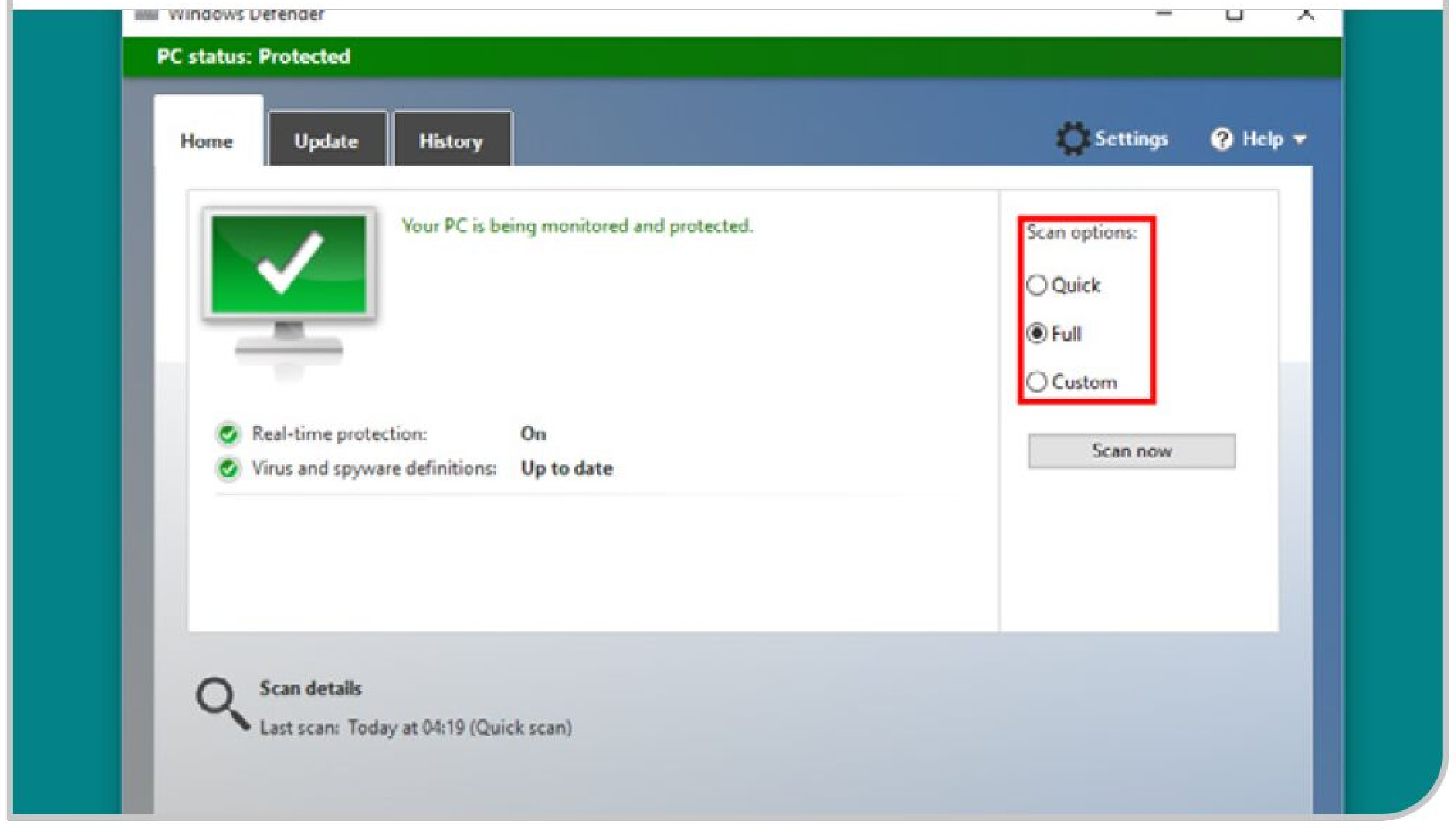
Installing...

You can close or minimise the application window during this update.

Did you know?

Virus, spyware and other malware definitions are files that are used to identify malicious or potentially unwanted software on your PC.
These definitions are updated automatically, but you can also click Update to get the latest versions whenever you want.

STEP 4 Once your definitions are updated, click back on the Home tab. On the right you'll see three buttons for: Quick, Full or Custom scans. If this is the first time you've scanned the system or if it's been a while since you last did it, click on the Full button.



PC status: Protected

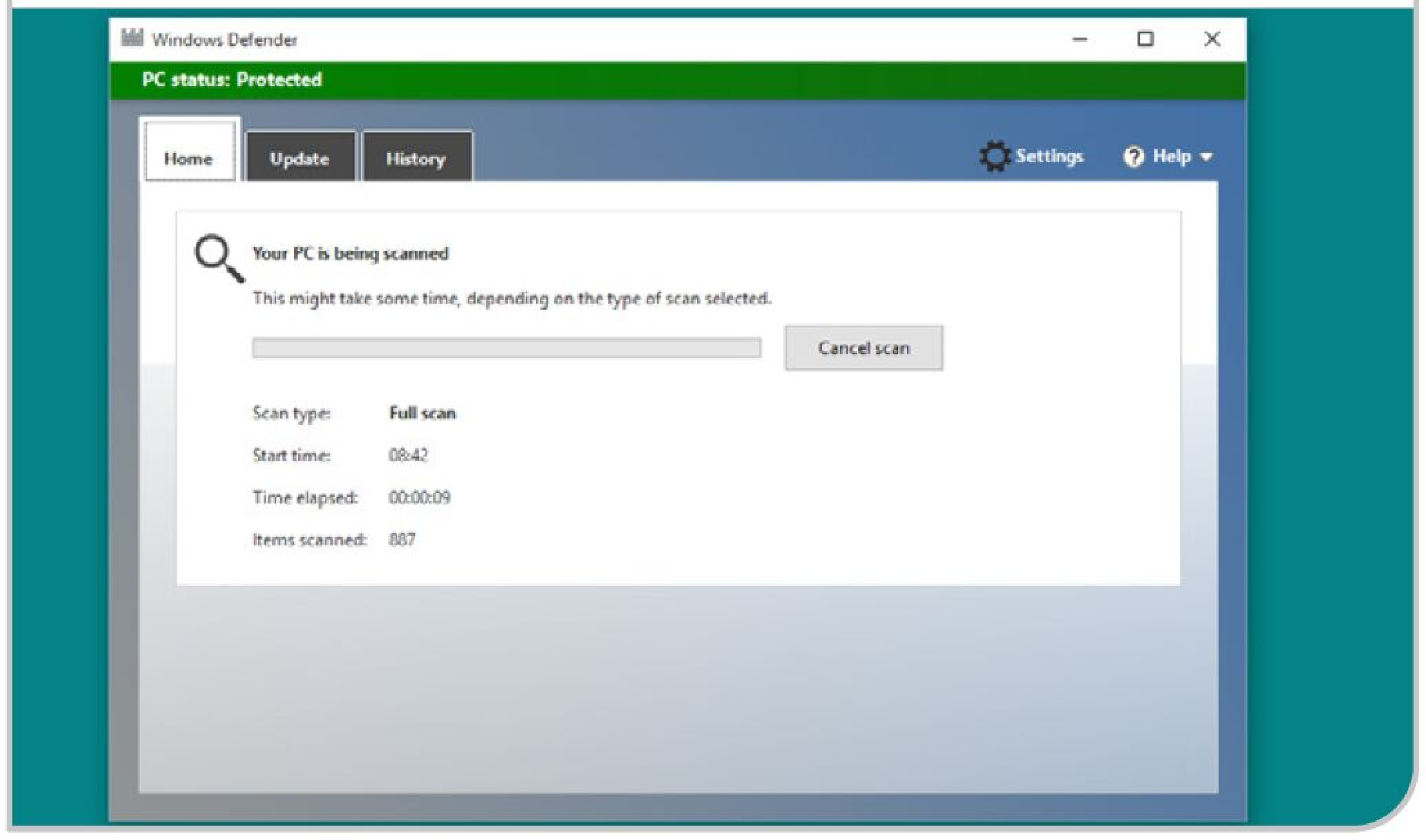
Your PC is being monitored and protected.

Scan options:
○ Quick
● Full
○ Custom

Real-time protection: On
Virus and spyware definitions: Up to date

Last scan: Today at 04:19 (Quick scan)

STEP 5 Click on the "Scan now" button. If you've selected a full scan, Defender will then check your entire system, looking for viruses and other malware. Depending on the number of files you have this could take a long time, possibly a couple of hours.



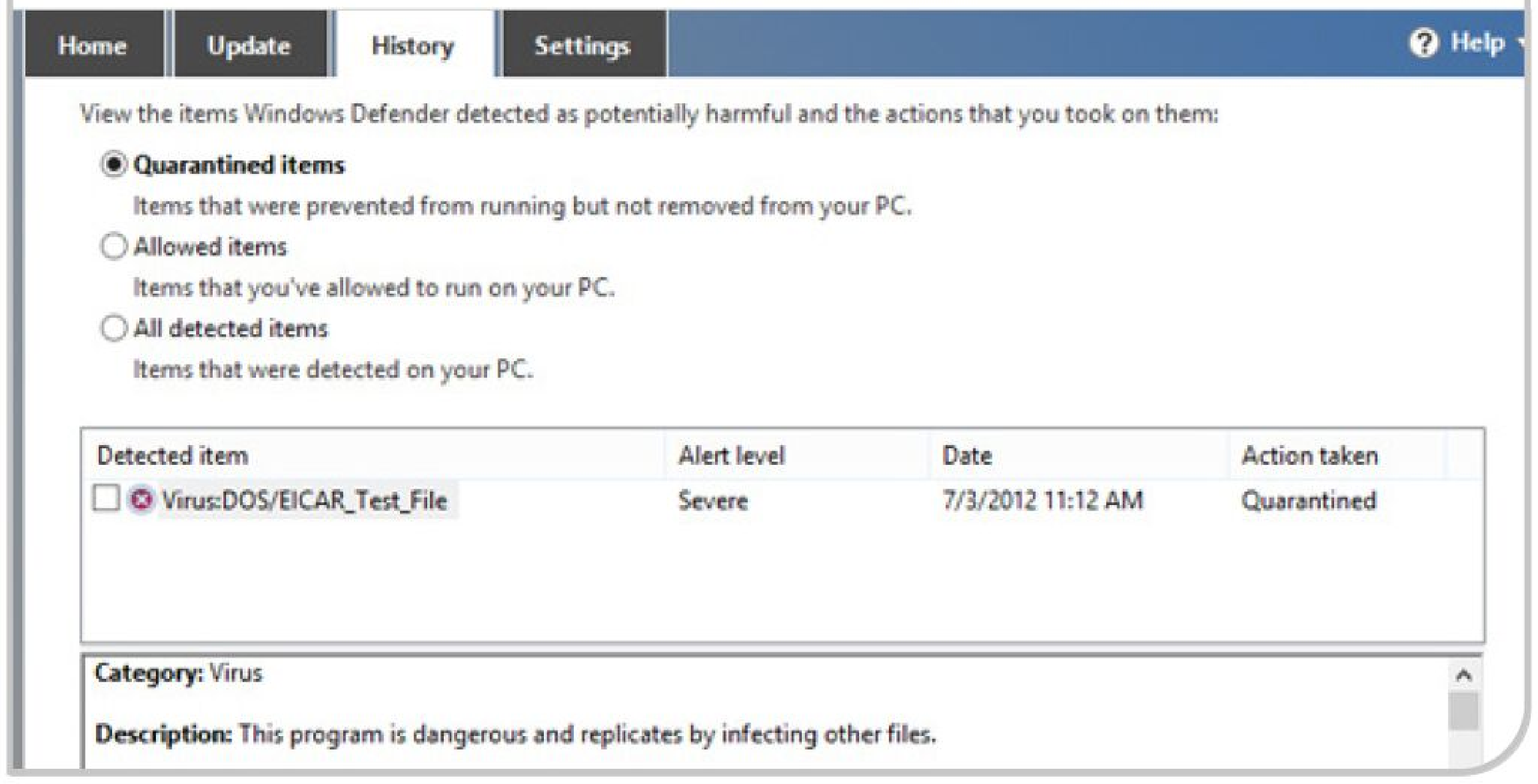
PC status: Protected

Your PC is being scanned

This might take some time, depending on the type of scan selected.

Scan type: Full scan
Start time: 08:42
Time elapsed: 00:00:09
Items scanned: 887

STEP 6 If Defender finds any malware on your system it will attempt to "disinfect" the file by removing the malicious elements. The most likely source of malware is your email, so Defender may delete emails that contain viruses.



View the items Windows Defender detected as potentially harmful and the actions that you took on them:

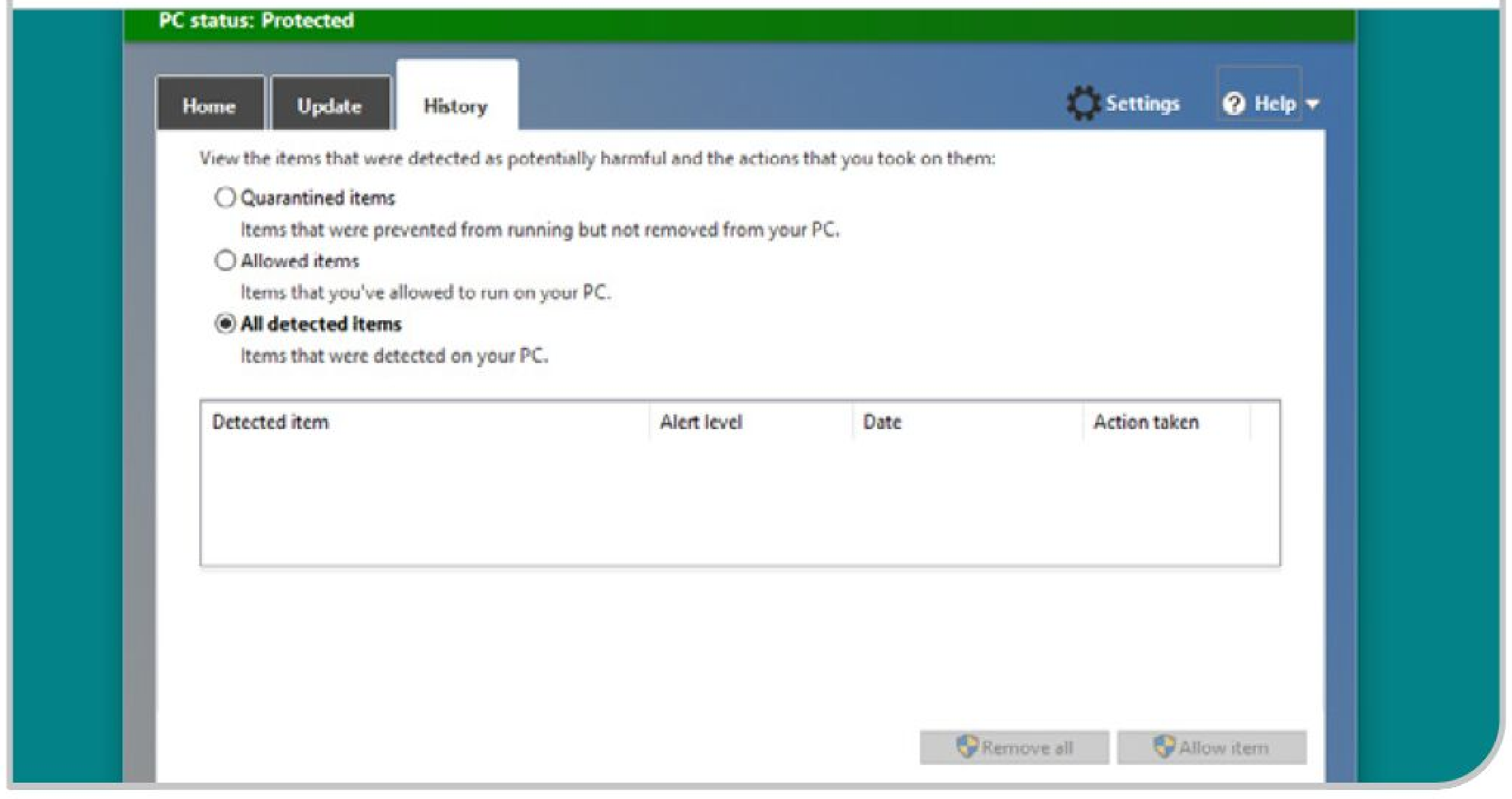
● Quarantined items
Items that were prevented from running but not removed from your PC.
○ Allowed items
Items that you've allowed to run on your PC.
○ All detected items
Items that were detected on your PC.

Detected item	Alert level	Date	Action taken
☐ Virus:DOS/EICAR_Test_File	Severe	7/3/2012 11:12 AM	Quarantined

Category: Virus

Description: This program is dangerous and replicates by infecting other files.

STEP 7 If Defender finds any files that are so badly infected that they cannot be disinfected, it will pop up a message asking you if it's OK to delete the file. In most cases this is the best course of action, however if the file is a vital part of the operating system your only recourse may be to format and reinstall.



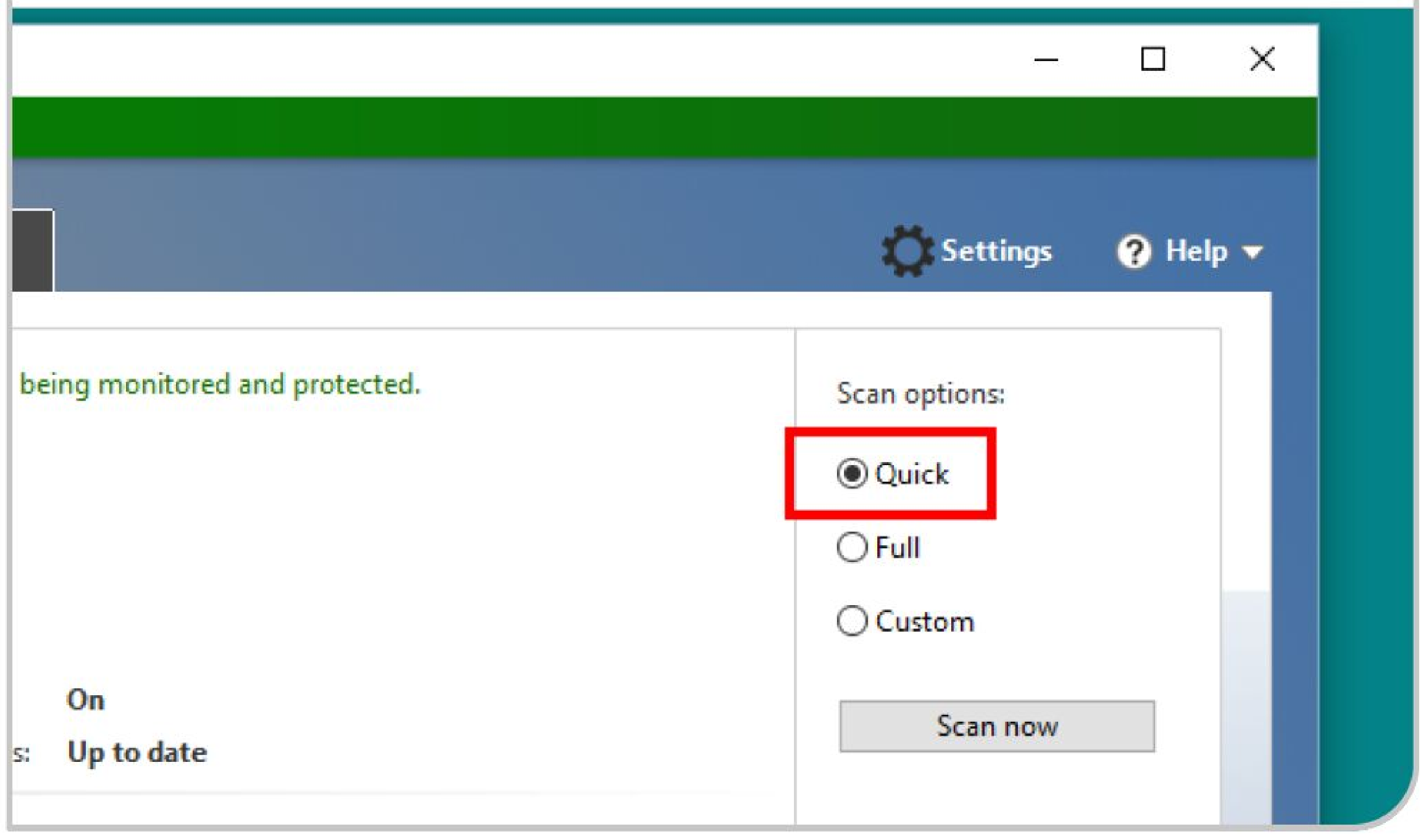
PC status: Protected

View the items that were detected as potentially harmful and the actions that you took on them:

○ Quarantined items
Items that were prevented from running but not removed from your PC.
○ Allowed items
Items that you've allowed to run on your PC.
● All detected items
Items that were detected on your PC.

Detected item	Alert level	Date	Action taken

STEP 8 Once your PC has been scanned, Windows Defender will continue to monitor it for suspicious software. To maintain a good level of protection it's a good idea to use the Quick Scan option on your system once a week.



being monitored and protected.

Scan options:
● Quick
○ Full
○ Custom

On
s: Up to date

Upgrading to a Solid State Drive (SSD)

Solid state drives have many advantages over hard disk drives. They are based on solid state flash memory, similar to the SD card in your mobile phone or digital camera. They have much faster read and write times than disk drives, which means that Windows will launch and run faster. Your apps will load and access data much more quickly too. If you decide to add an SSD after finishing the build, here's how to do it.

WHY CHOOSE SSD?

Since they have no moving parts they are much more durable and less prone to damage than the spinning magnetic disk of an HDD, so you're a lot less likely to lose precious data. They are also unaffected by magnetic fields. SSDs used to be expensive but prices have dropped dramatically over the past couple of years. Fitting an SSD to your computer is a fairly simple procedure, requiring only basic tools and should take less than half an hour. As with the RAM upgrade, if you're not confident that you can carry out this procedure safely, your local computer store will be happy to do the work for you for a fee. If you want to transfer your entire system onto the SSD, which we'll cover in the next section, you'll need to make sure that the drive is large enough to hold both your OS and your installed apps. For most home PCs a 256GB SSD should be plenty big enough; you can always install a high capacity HDD for bulk data storage such as large photo or video collections, since these are less performance dependant.

Note that older PCs may not be able to accept an SSD. Check the manual or specification sheet to see if your computer has Serial ATA (SATA) connection support. You'll find it listed under "Drives" or "Internal I/O Connectors". Check also that your PC's power supply has spare connectors to power SATA devices. If it does, then you're good to go.

SATA3
SATA EXPRESS
LOTES
TA_EXPRESS

THINGS YOU'LL NEED

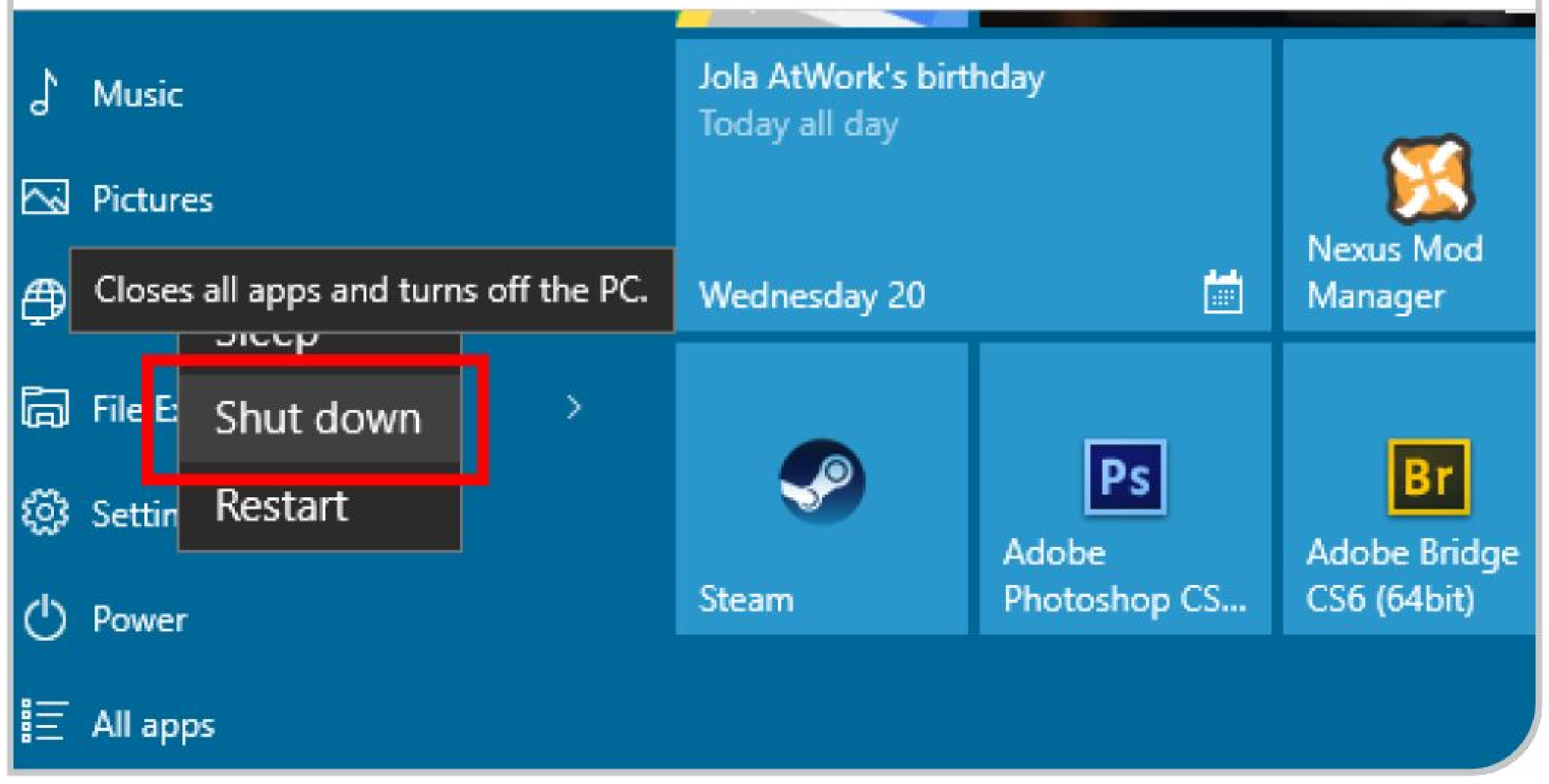
- The manual or specification sheet that came with your computer
- A small crosshead screwdriver
- An SSD drive big enough to replace your HDD
- A SATA data cable (probably comes with the SSD)
- A small torch is also helpful

DISCLAIMER

Opening up your PC and making alterations to its internal components carries the risk of damaging your PC, as well as the personal risk of injury or electrocution if you do not take the necessary precautions. You may also void the warranty on your equipment. If you are not completely confident that you can carry out this operation safely DO NOT ATTEMPT IT. You do so entirely at your own risk. Black Dog Media cannot accept any responsibility for any damage or injury to yourself or your property as a result of following this tutorial.

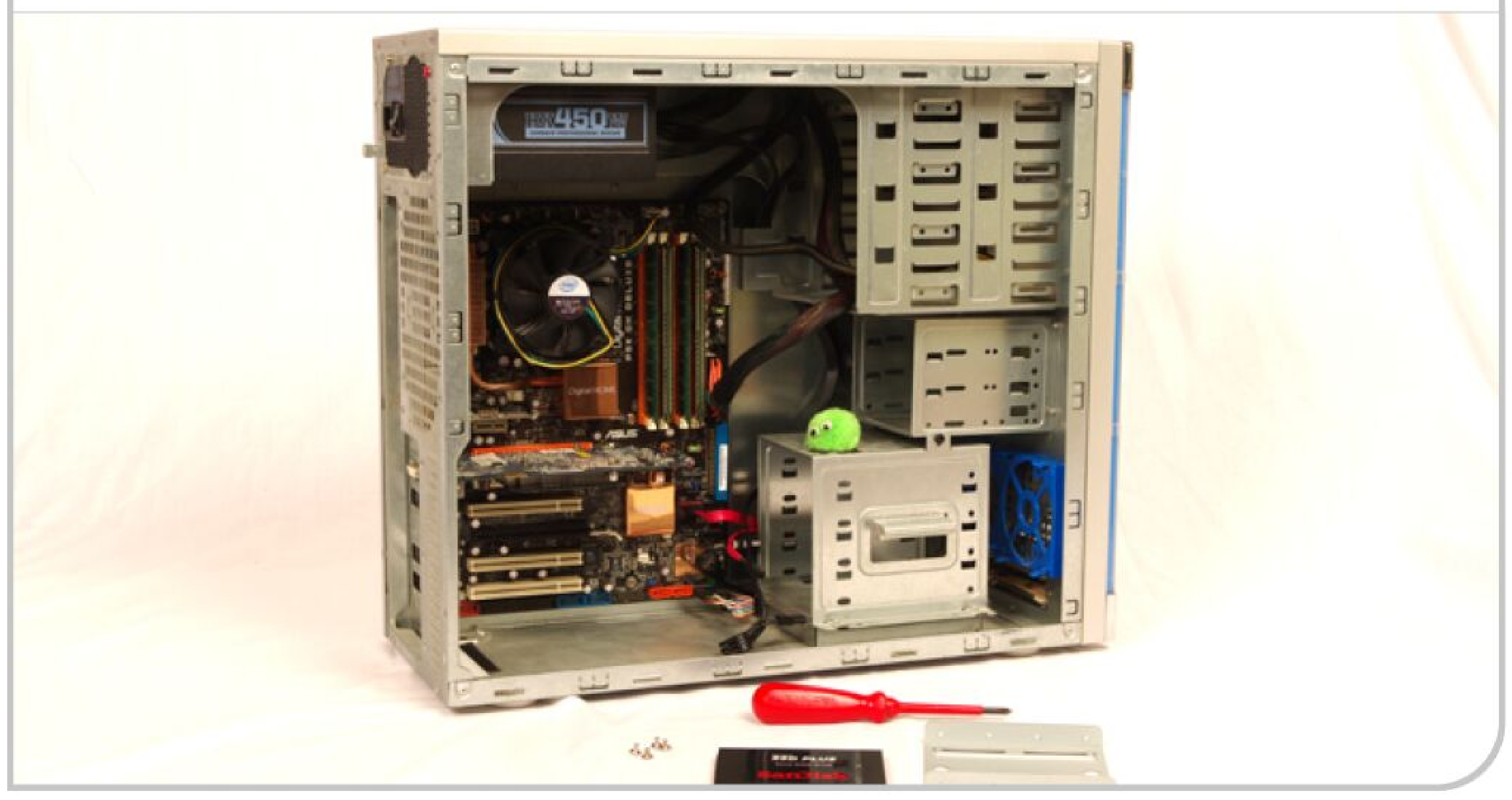
Fitting the SSD

STEP 1 Shut down your PC, unplug it from the mains and disconnect the mouse, keyboard, monitor and any other attached devices; then leave it for half an hour to ensure that residual voltage in the capacitors has dissipated and any hot components have cooled down.

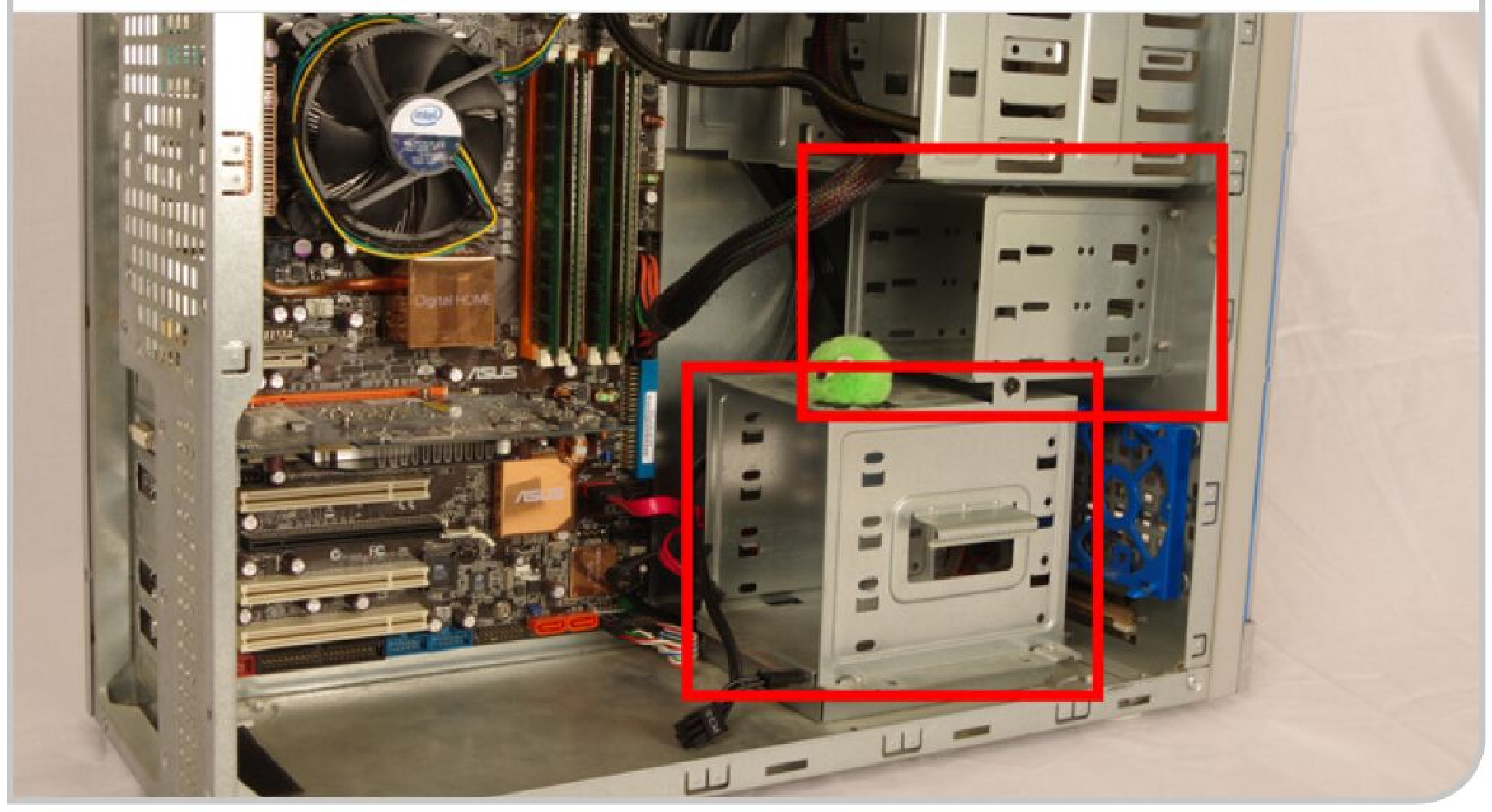

Music
Pictures
Sleep
Shut down
Restart
File E
Settin
Power
All apps
Jola AtWork's birthday
Today all day
Wednesday 20
Nexus Mod Manager
Steam
Ps
Adobe Photoshop CS...
Br
Adobe Bridge CS6 (64bit)

Closes all apps and turns off the PC.

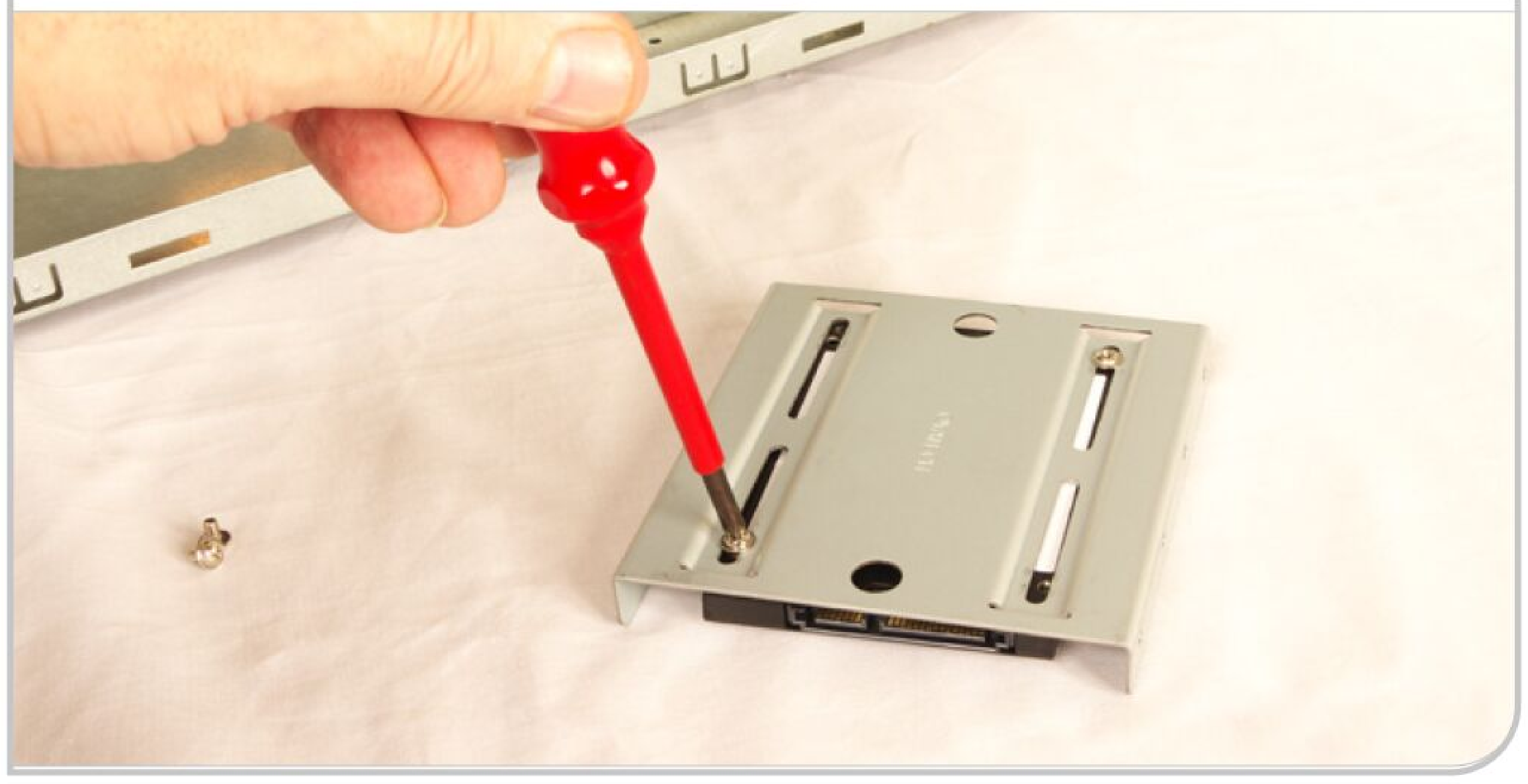
STEP 2 For a desktop PC open the side of the case so that you can access the area where the HDD is located. You may need a small screwdriver to remove a few case screws but many cases open without tools. Don't lose the screws!



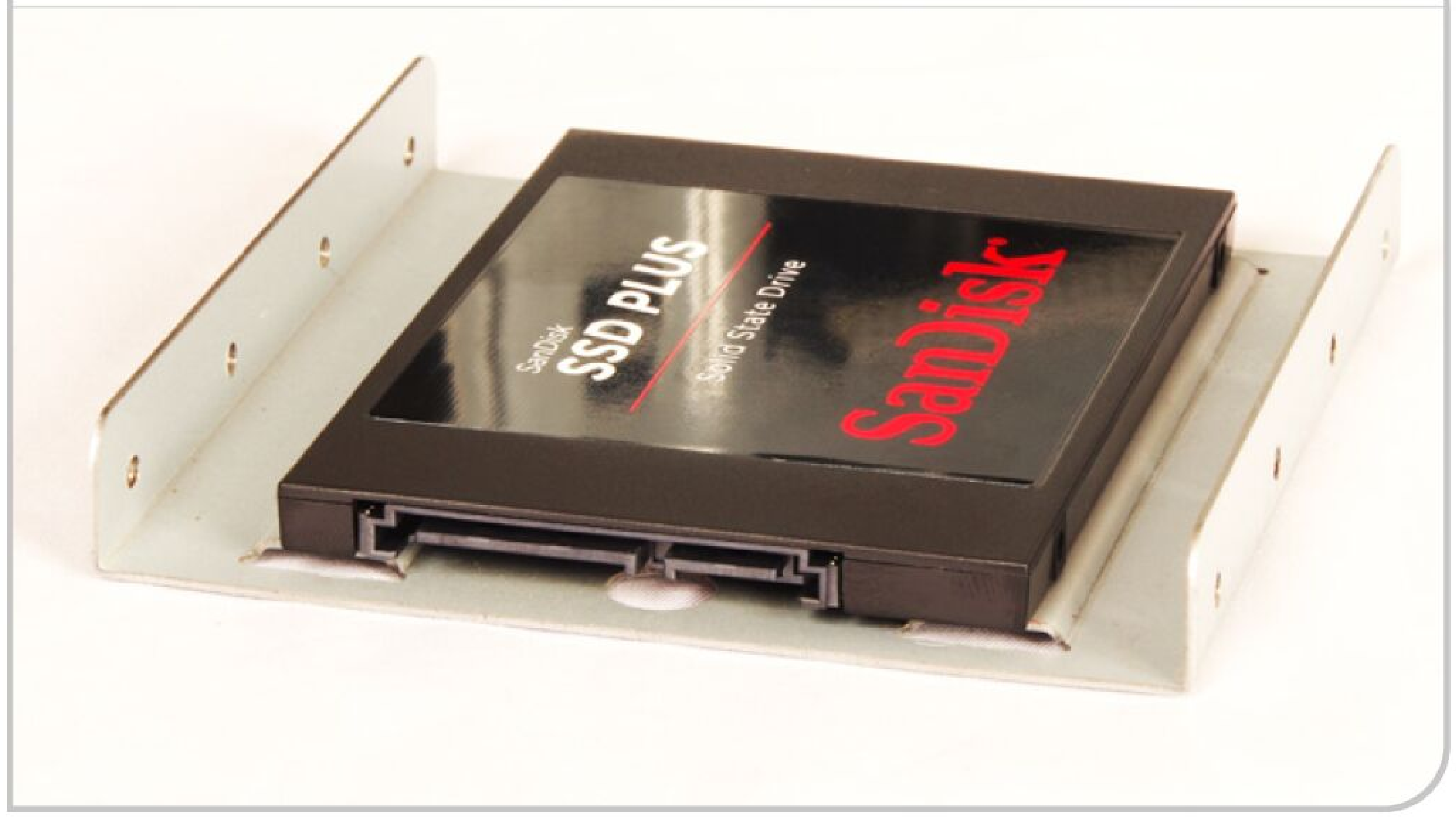
STEP 3 AN SSD can fit into either a 3.5-inch (floppy disk drive) bay or a 5.25-inch (HDD/optical drive) bay. Since many recent PC cases no longer have 3.5-inch bays we'll show how to fit your SSD into the larger one.



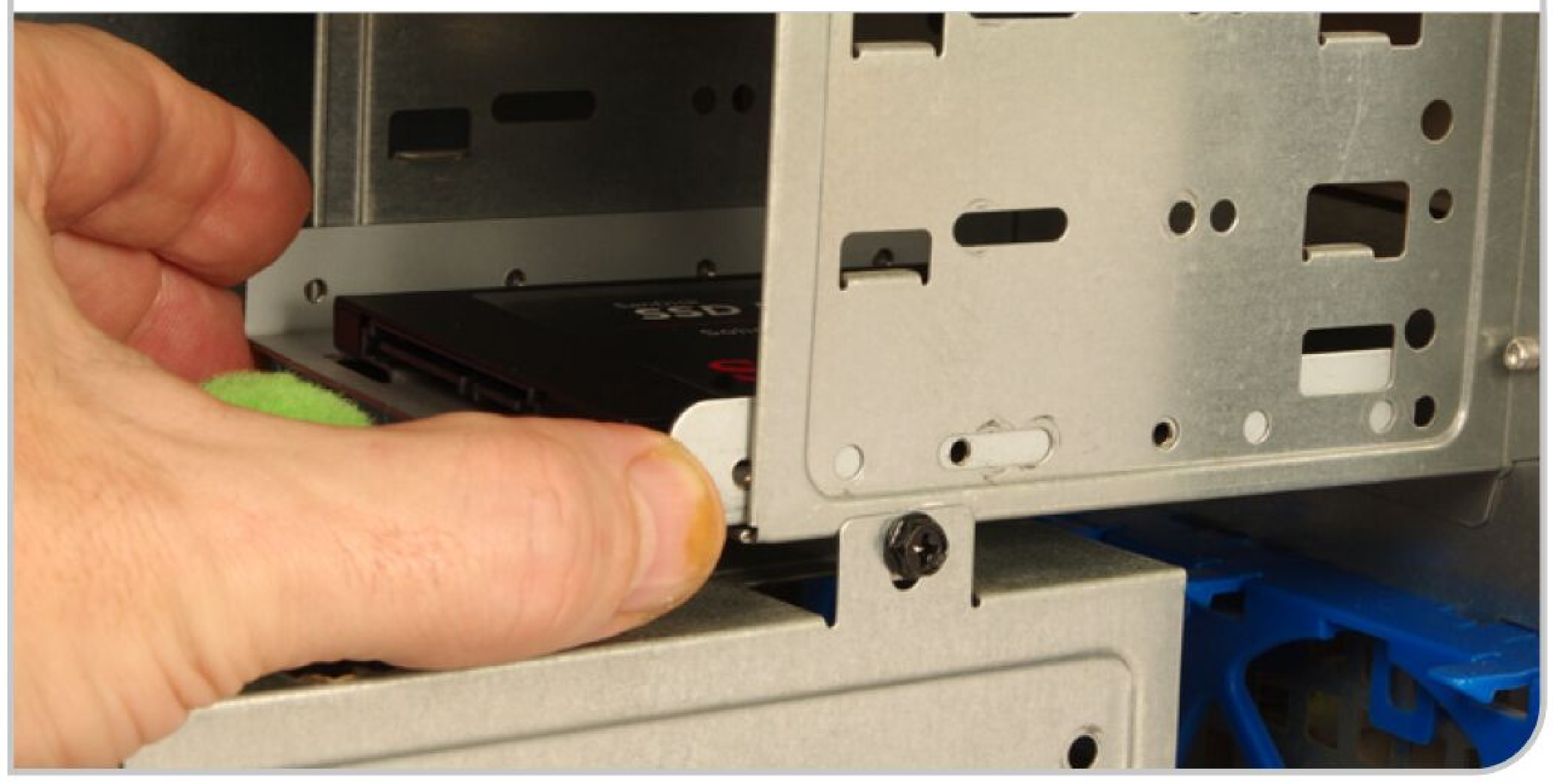
STEP 4 Your new SSD should come with an adapter plate to fit it into a 5.25-inch drive bay, as well as the required fitting screws. The first action is to attach the SSD to this plate. Don't over tighten the screws or you may damage the drive.



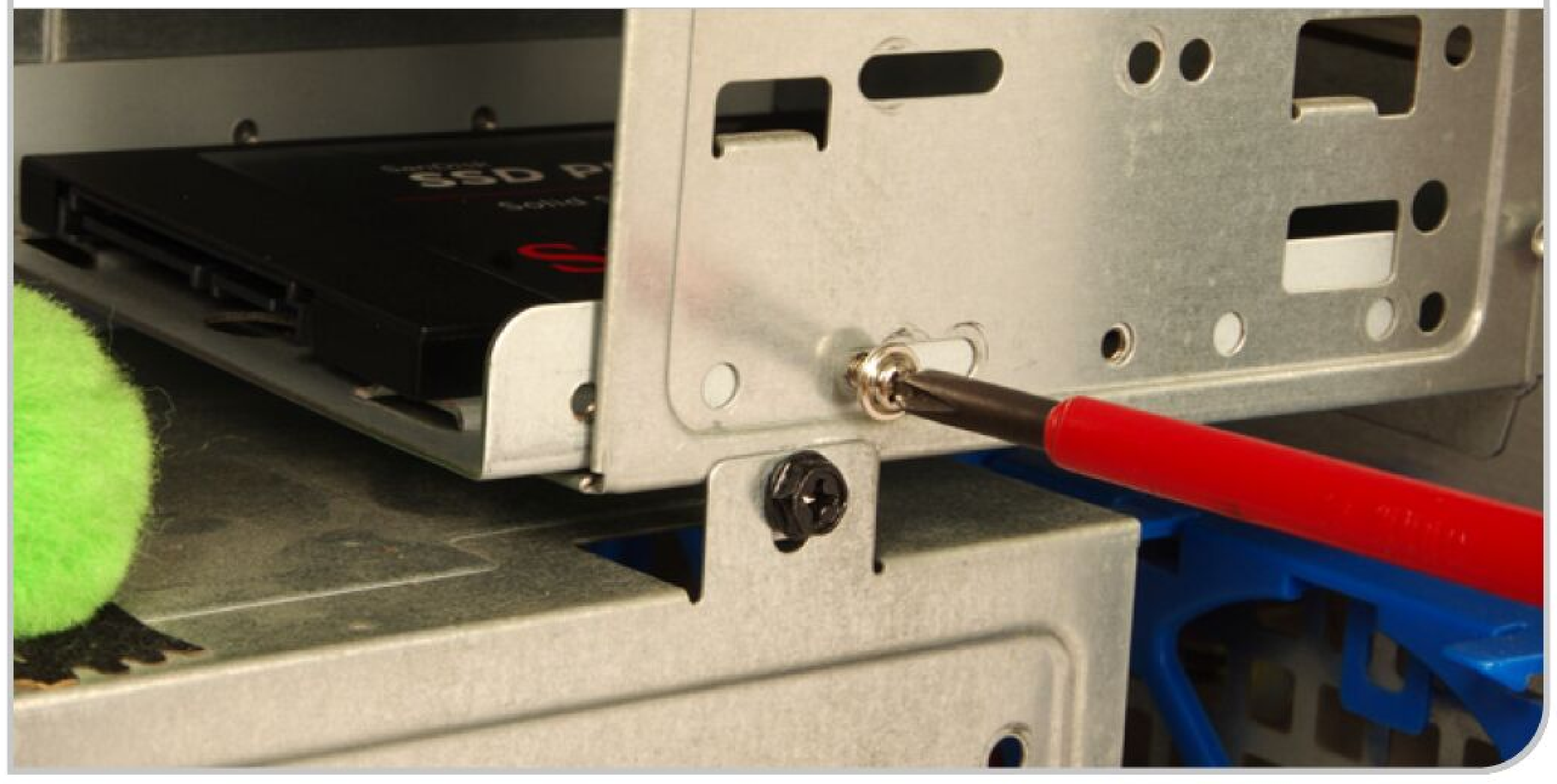
STEP 5 Note that one end of the SSD has the connectors on it. You'll need to position the device so that your power and SATA data cables can reach these connectors.


SanDisk
SSD PLUS
Solid State Drive
SanDisk

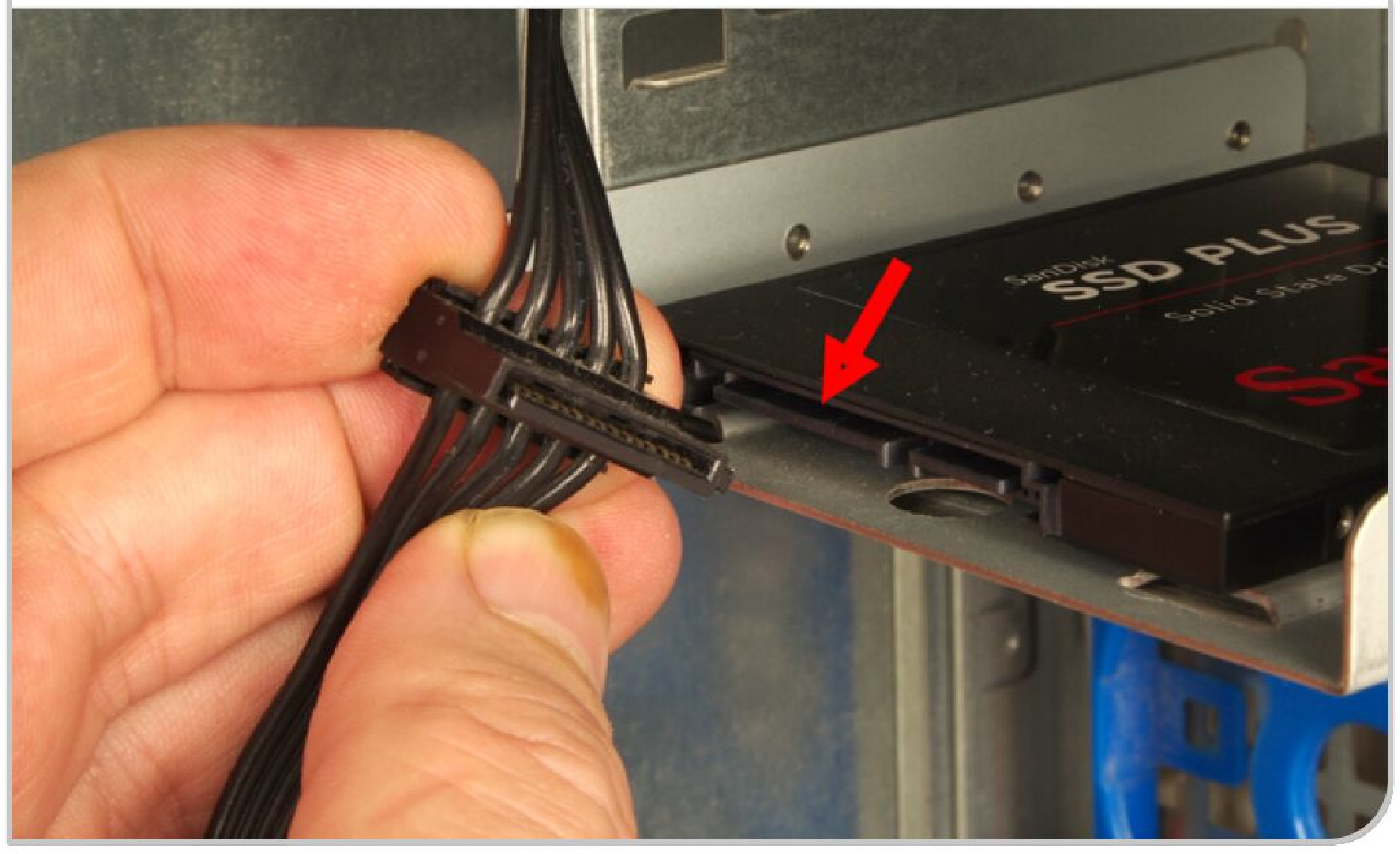
STEP 6 Once you've decided on a good position for the SSD within the drive bay, carefully slot the drive on its mounting plate into the drive bay. Position it so that the screw holes on the PC chassis line up with the holes on the mounting plate.



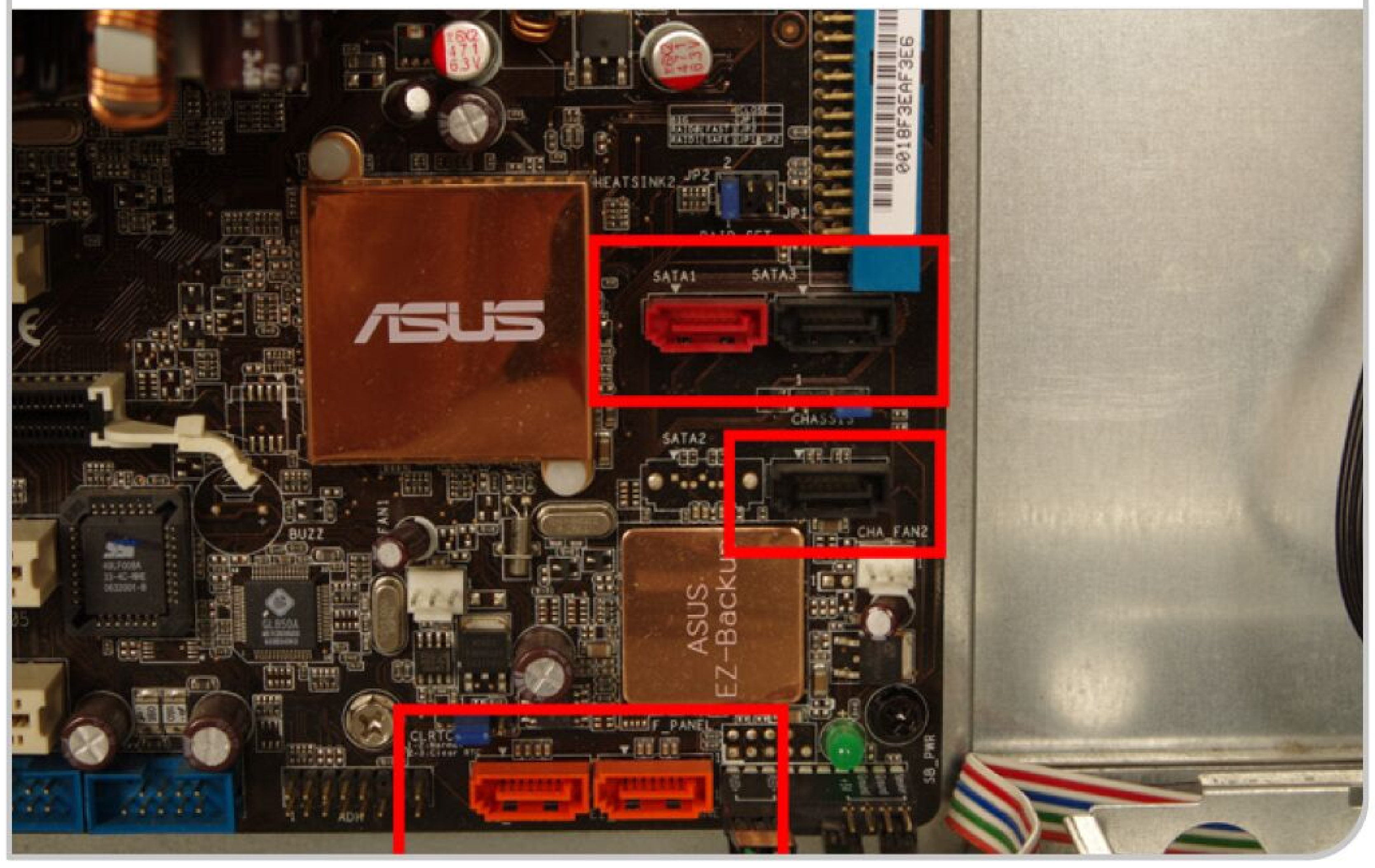
STEP 7 Using the supplied mounting screws, fix the mounting plate holding the SSD in position. If you can't easily access all four screw holes don't worry; as long as the drive doesn't move, just using two screws will be fine.



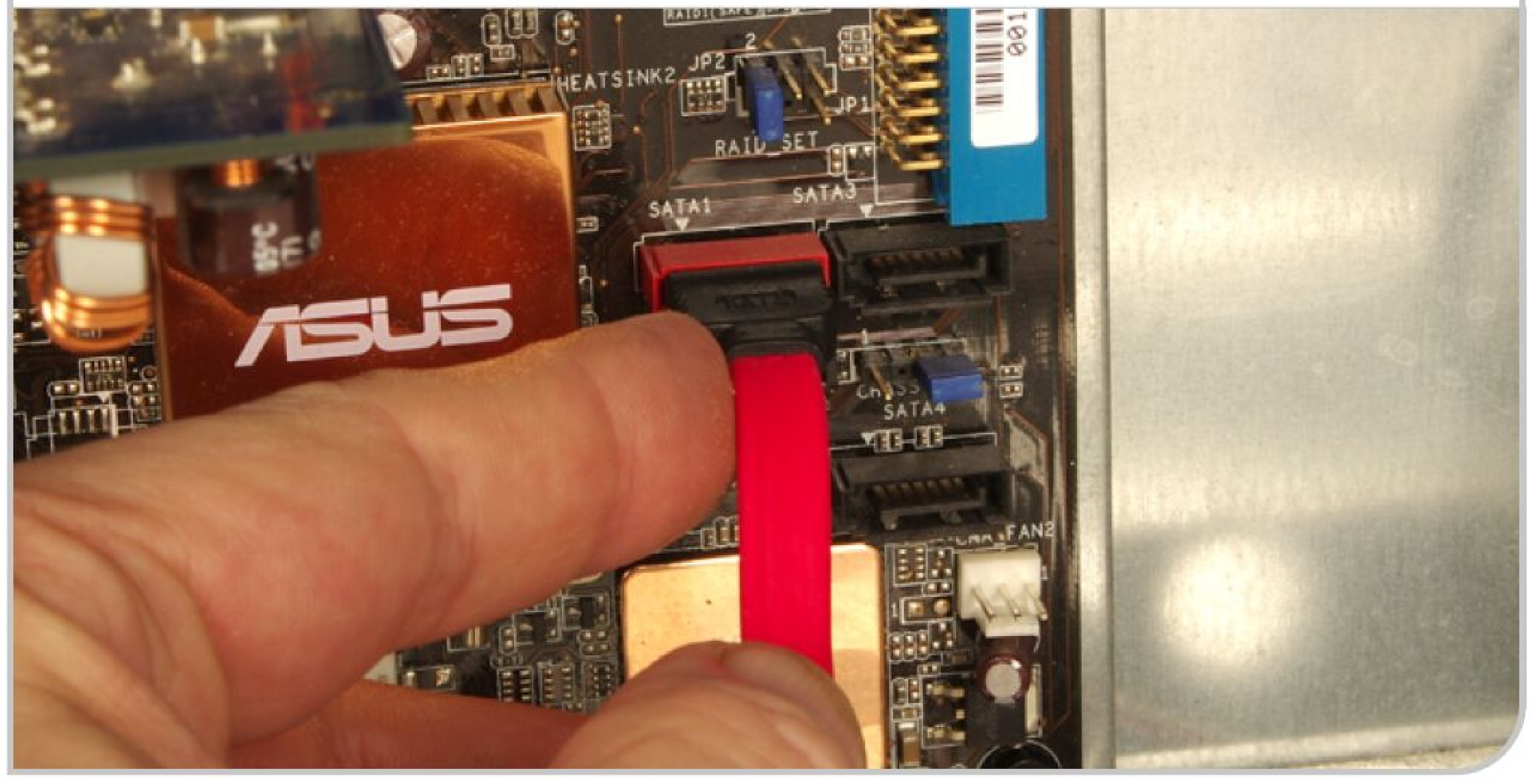
STEP 8 Connect the SATA power connector from your PC's power supply to the power socket on your SSD. It can only connect in one way, so you can't get it the wrong way round.



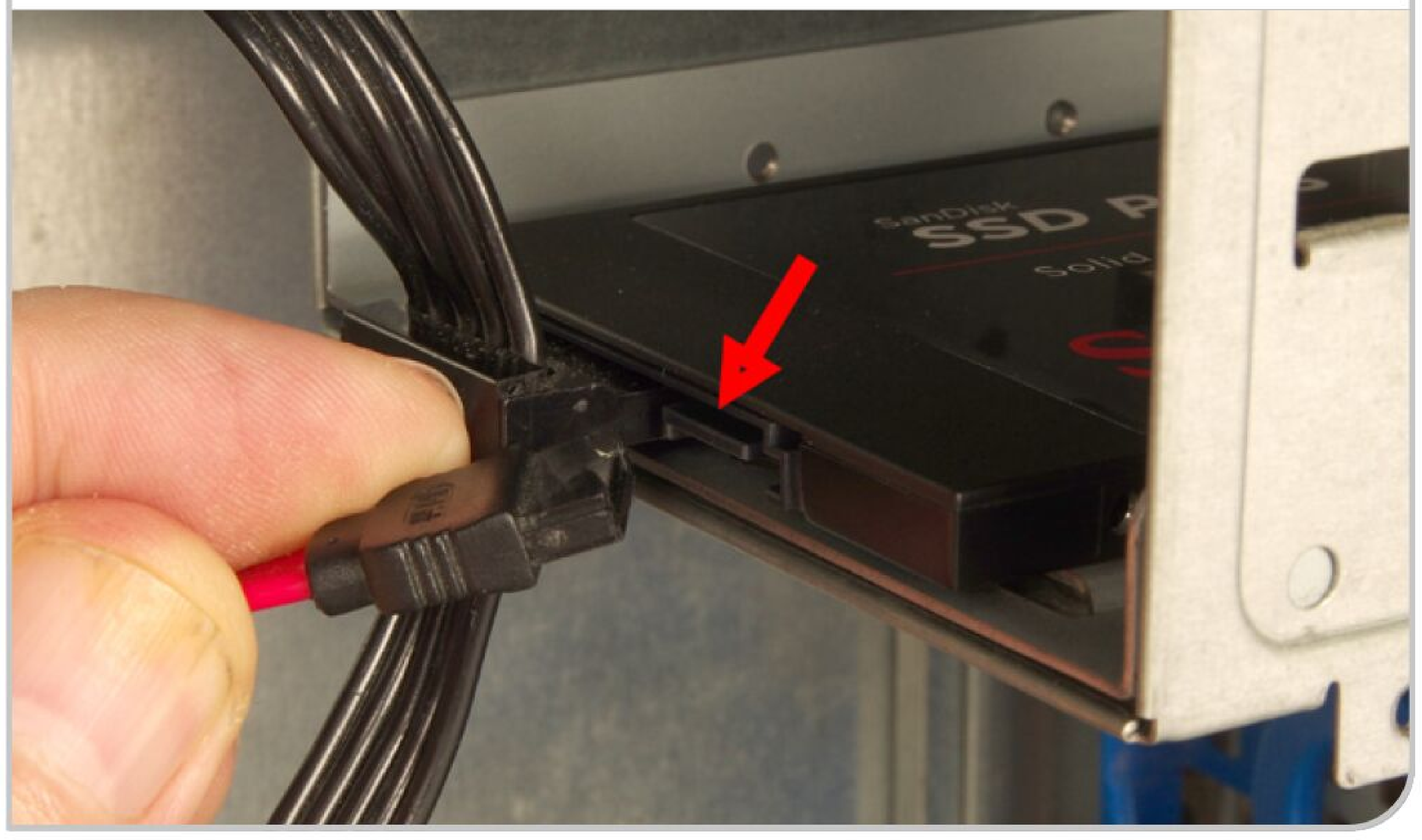
STEP 9 Locate a SATA data connector on your PC's motherboard. Most recent boards will probably have several SATA connectors; they're easy to spot as they're shaped like the letter L.



STEP 10 Plug one end of your SATA data cable into the socket on the motherboard. It should click into place. It can only go in one way and the two ends are identical, so you can't connect it the wrong way round.

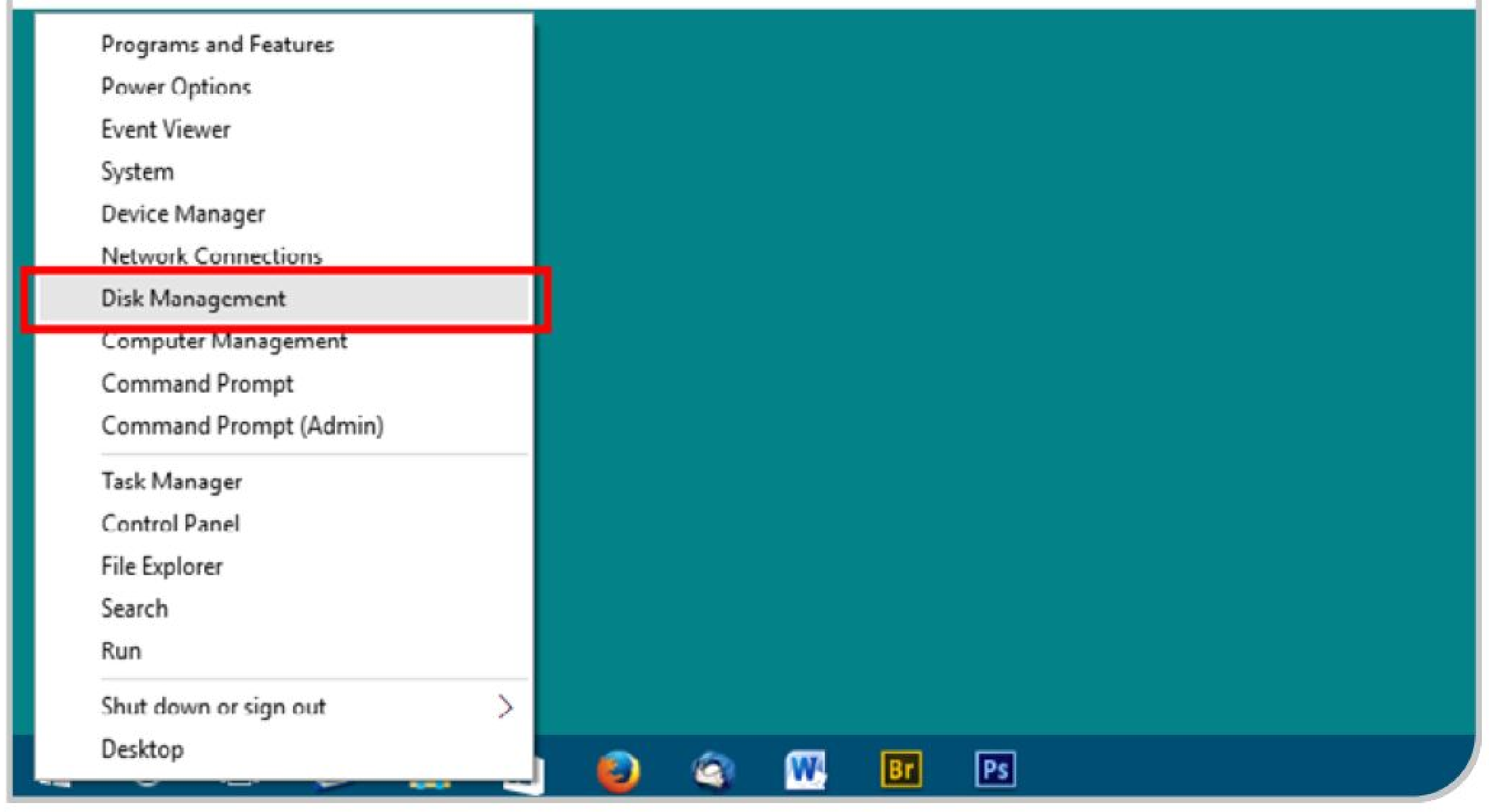


STEP 11 Plug the other end of the SATA data cable into the socket on the SSD. Push it in all the way until it clicks. It can only go in one way, so you can't connect it the wrong way round. Push firmly but don't force it.

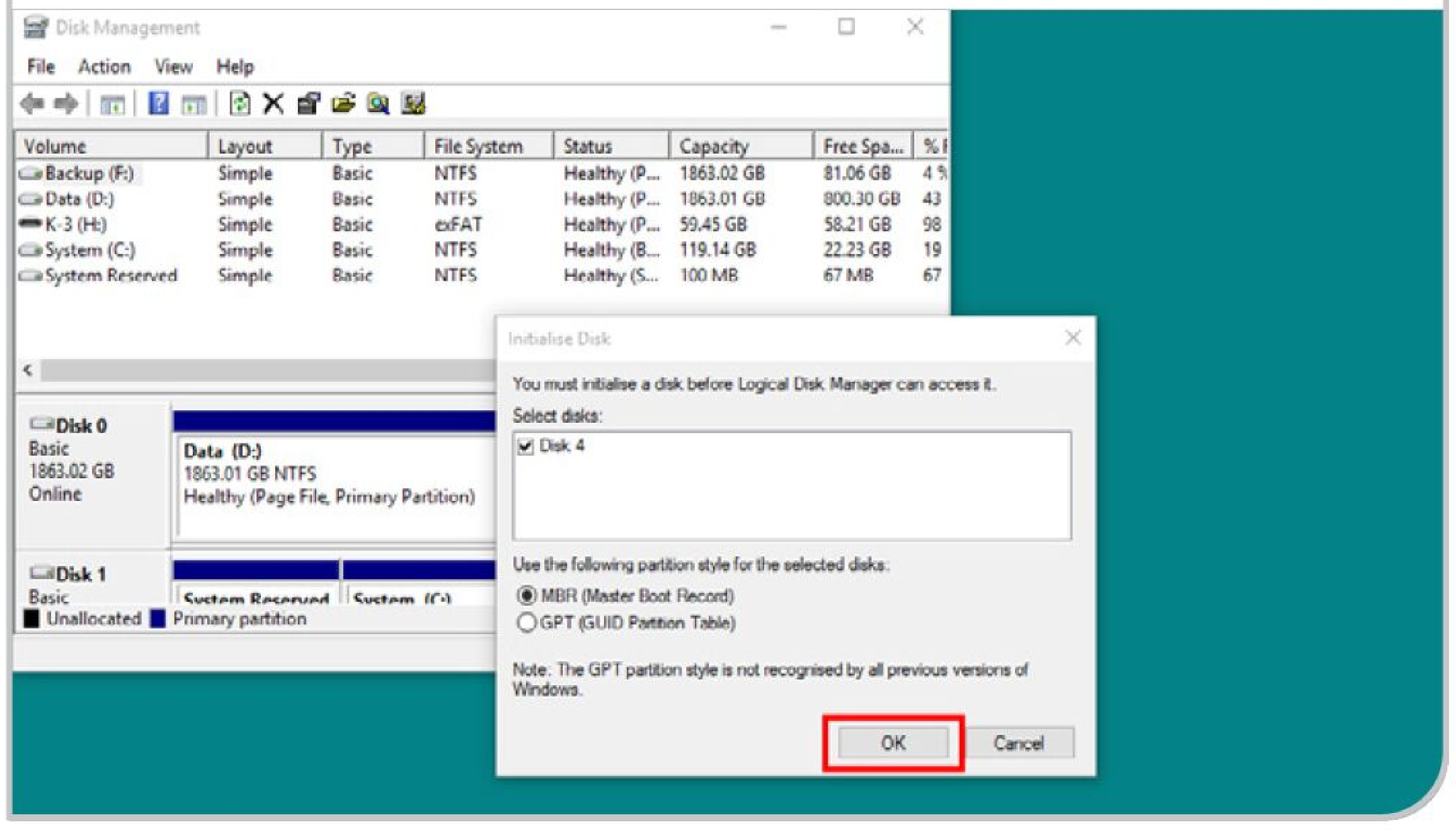


STEP 12 Now you can close up the case, reconnect your mouse, keyboard, monitor and any other devices, plug the PC back in to the mains and switch it on.

STEP 13 Once Windows has launched you'll need to initialise your new drive before you can start using it. Right-click on the Start button and select Disk Management.


Programs and Features
Power Options
Event Viewer
System
Device Manager
Network Connections
Disk Management
Computer Management
Command Prompt
Command Prompt (Admin)
Task Manager
Control Panel
File Explorer
Search
Run
Shut down or sign out
Desktop

STEP 14 As soon as you start Disk Management, Windows will automatically detect the new drive and prompt you to initialise it. The new drive will be shown in the pop-up window. Check that MBR (Master Boot Record) is checked and click OK.


Disk Management
File
Action
View
Help

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	%
Backup (F:)	Simple	Basic	NTFS	Healthy (P...	1863.02 GB	81.06 GB	4
Data (D:)	Simple	Basic	NTFS	Healthy (P...	1863.01 GB	800.30 GB	43
K-3 (H:)	Simple	Basic	exFAT	Healthy (P...	59.45 GB	58.21 GB	98
System (C:)	Simple	Basic	NTFS	Healthy (B...	119.14 GB	22.23 GB	19
System Reserved	Simple	Basic	NTFS	Healthy (S...	100 MB	67 MB	67

Disk 0
Basic
1863.02 GB
Online

Data (D:)
1863.01 GB NTFS
Healthy (Page File, Primary Partition)

Disk 1
Basic

System Reserved
System (C:)

■ Unallocated ■ Primary partition

Initialise Disk

You must initialise a disk before Logical Disk Manager can access it.

Select disks:

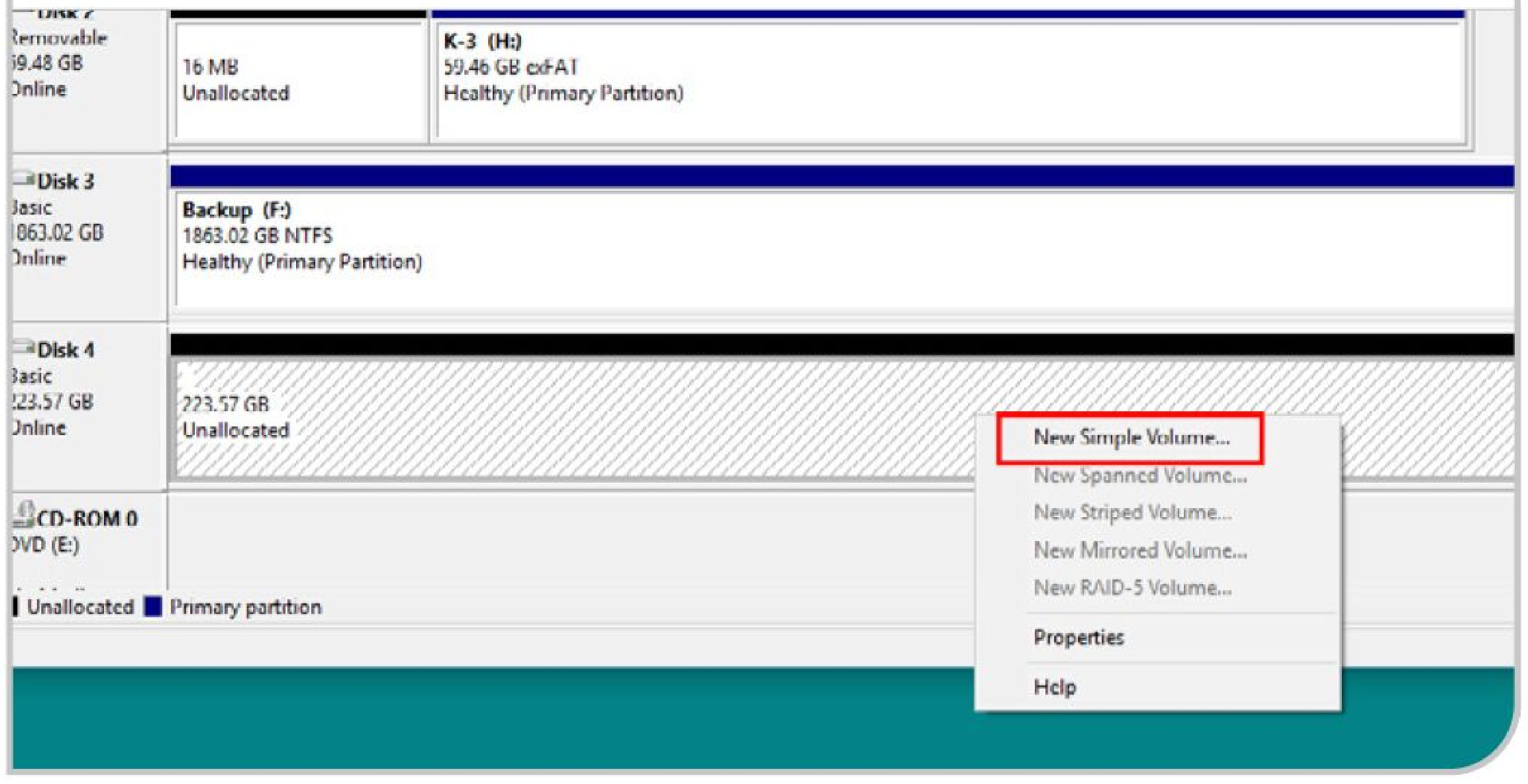
☑ Disk 4

Use the following partition style for the selected disks:

● MBR (Master Boot Record)
○ GPT (GUID Partition Table)

Note: The GPT partition style is not recognised by all previous versions of Windows.

STEP 15 Right-click on the new drive and select New Simple Volume from the pop-up menu. This prepares the SSD to accept new data using the Windows NTFS file system. Click OK through the series of Wizard windows.


Removable
59.48 GB
Online

16 MB
Unallocated

K-3 (H:)
59.46 GB exFAT
Healthy (Primary Partition)

Disk 3
Basic
1863.02 GB
Online

Backup (F:)
1863.02 GB NTFS
Healthy (Primary Partition)

Disk 4
Basic
223.57 GB
Online

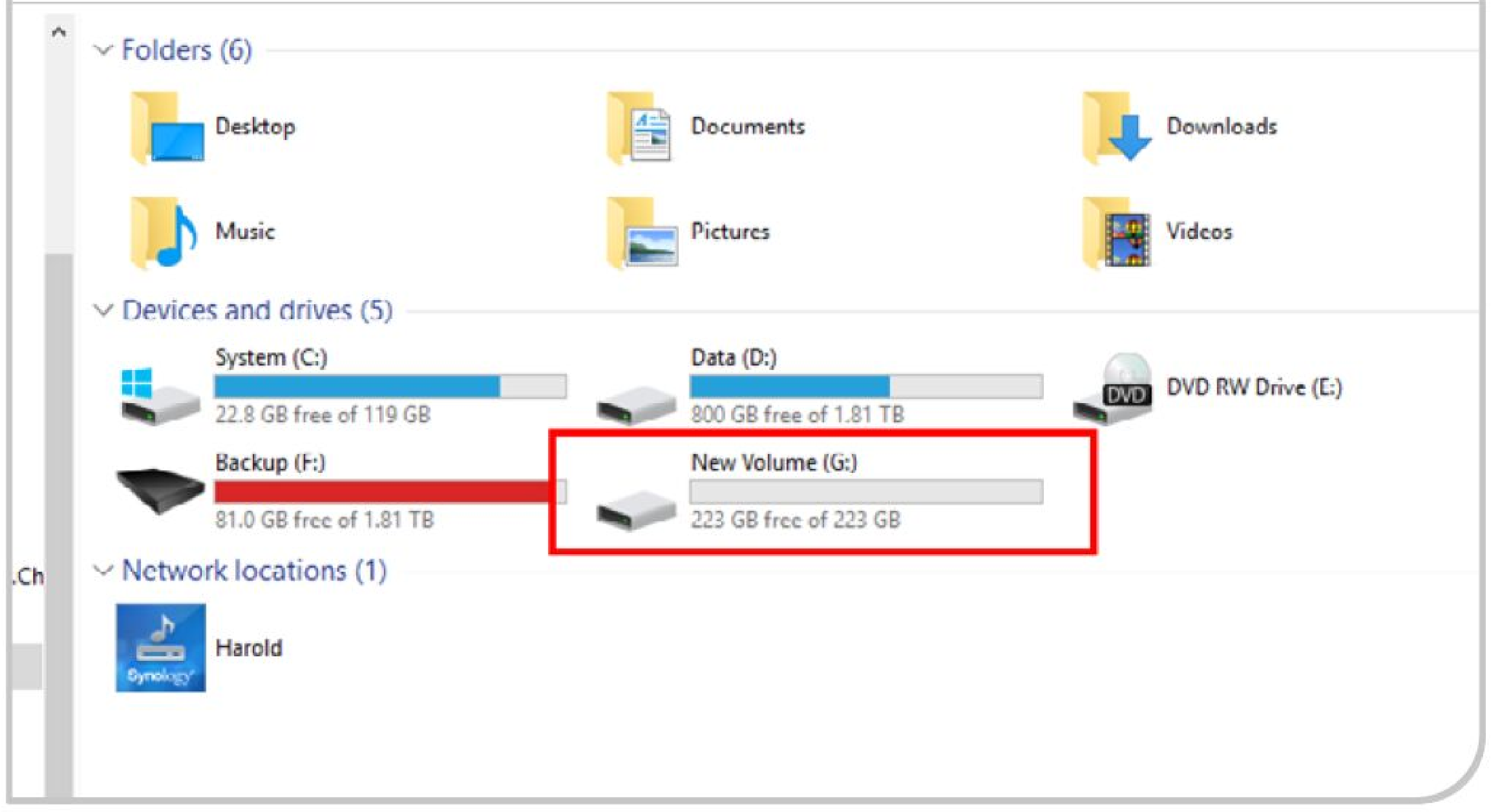
223.57 GB
Unallocated

CD-ROM 0
DVD (E:)

■ Unallocated ■ Primary partition

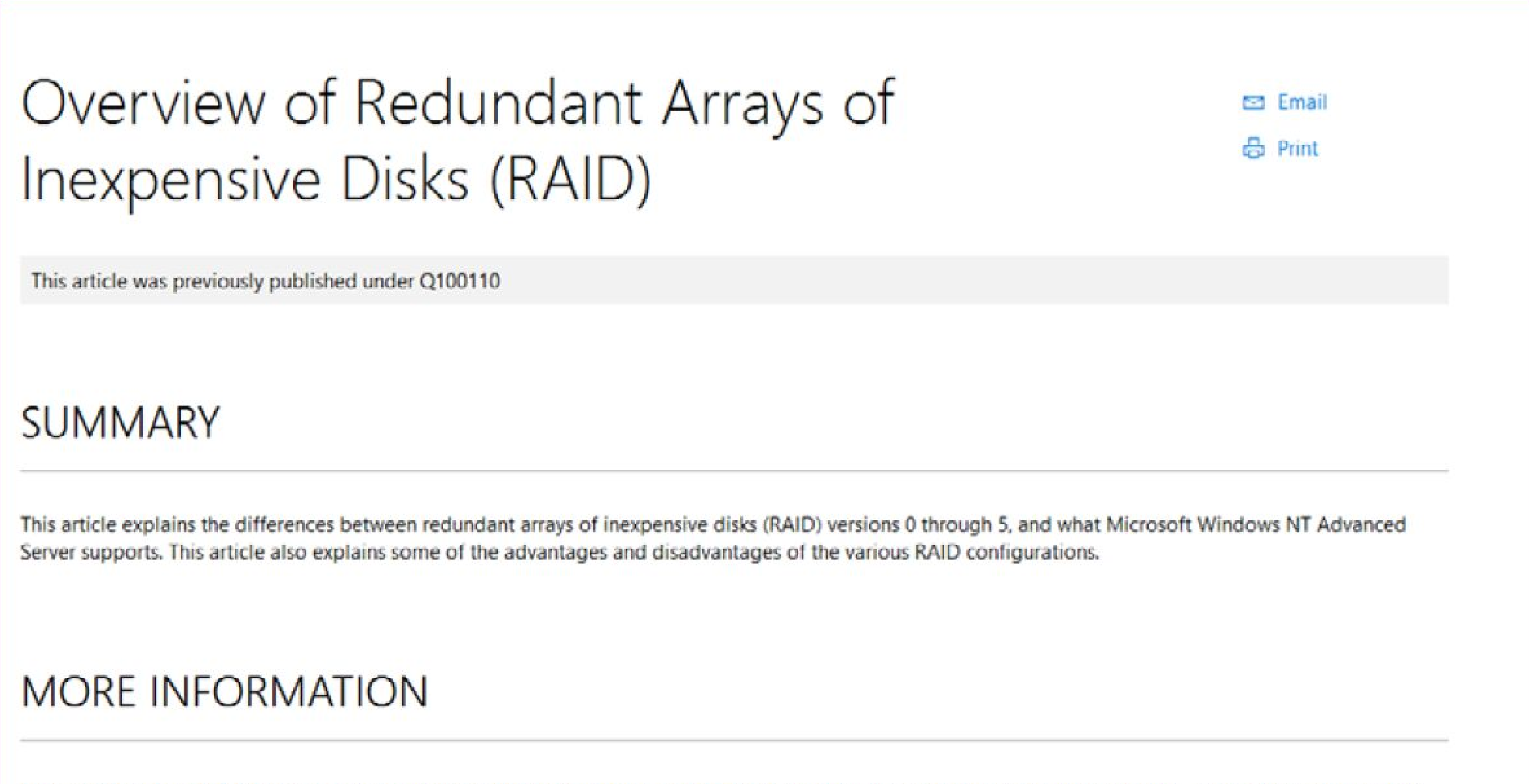
New Simple Volume...
New Spanned Volume...
New Striped Volume...
New Mirrored Volume...
New RAID-5 Volume...
Properties
Help

STEP 16 Close the Disk Management window and open File Explorer. You should now see the new drive listed. If you previously had only one drive, labelled C, the new drive should be labelled D. You can now start using the drive to store data or install apps.


Folders (6)
Desktop
Documents
Downloads
Music
Pictures
Videos
Devices and drives (5)
System (C:)
22.8 GB free of 119 GB
Data (D:)
800 GB free of 1.81 TB
DVD RW Drive (E:)
Backup (F:)
81.0 GB free of 1.81 TB
New Volume (G:)
223 GB free of 223 GB
Network locations (1)
Harold

SSD RAID ARRAYS

Since SSDs are currently generally of smaller capacity than HDDs, one solution to increase your storage capacity while still enjoying the speed and durability benefits of solid state technology is to use a RAID array. RAID stands for Redundant Array of Independent Disks (sometimes "inexpensive" disks) and is a way of making Windows tie several SSDs together and treat them as one single drive. This has many advantages, not least because the read and write times of a RAID array are frequently faster than for a single drive. Setting up a RAID array is not too difficult. For now, if you'd like to know more visit https://support.microsoft.com/en-us/kb/100110


Overview of Redundant Arrays of Inexpensive Disks (RAID)

Email
Print

This article was previously published under Q100110

SUMMARY

This article explains the differences between redundant arrays of inexpensive disks (RAID) versions 0 through 5, and what Microsoft Windows NT Advanced Server supports. This article also explains some of the advantages and disadvantages of the various RAID configurations.

MORE INFORMATION

Microsoft Windows NT Advanced Server supports only RAID 0, RAID 1, and RAID 5. Fault tolerance and disk array implementations, while generally based on the design described here, vary considerably among manufacturers.

Migrating Windows 10 to a New SSD

Moving your operating system onto a solid state drive will let Windows launch more quickly and speed up your whole system. In this section we'll look at a method for transferring your Windows 10 installation onto this new drive. There are several apps that can do this for you, but there is a fairly simple method that uses Windows 10's built-in backup system.

WHY MOVE THE OS?

As long as your SSD is big enough, you can transfer your entire installed system, including your apps and files, onto it but you'll gain a big performance boost even if you just have Windows and your core apps on the new drive.

If you're building a new system from scratch, the easiest approach is to simply install Windows 10 on the newly installed SSD. If you've bought a retail copy of Windows 10 you can install from the USB Flash drive that your copy came on. If you're upgrading from Windows 7 or 8 you'll need to install that operating system from the supplied DVD and then upgrade once you've got the system running and connected to the internet.

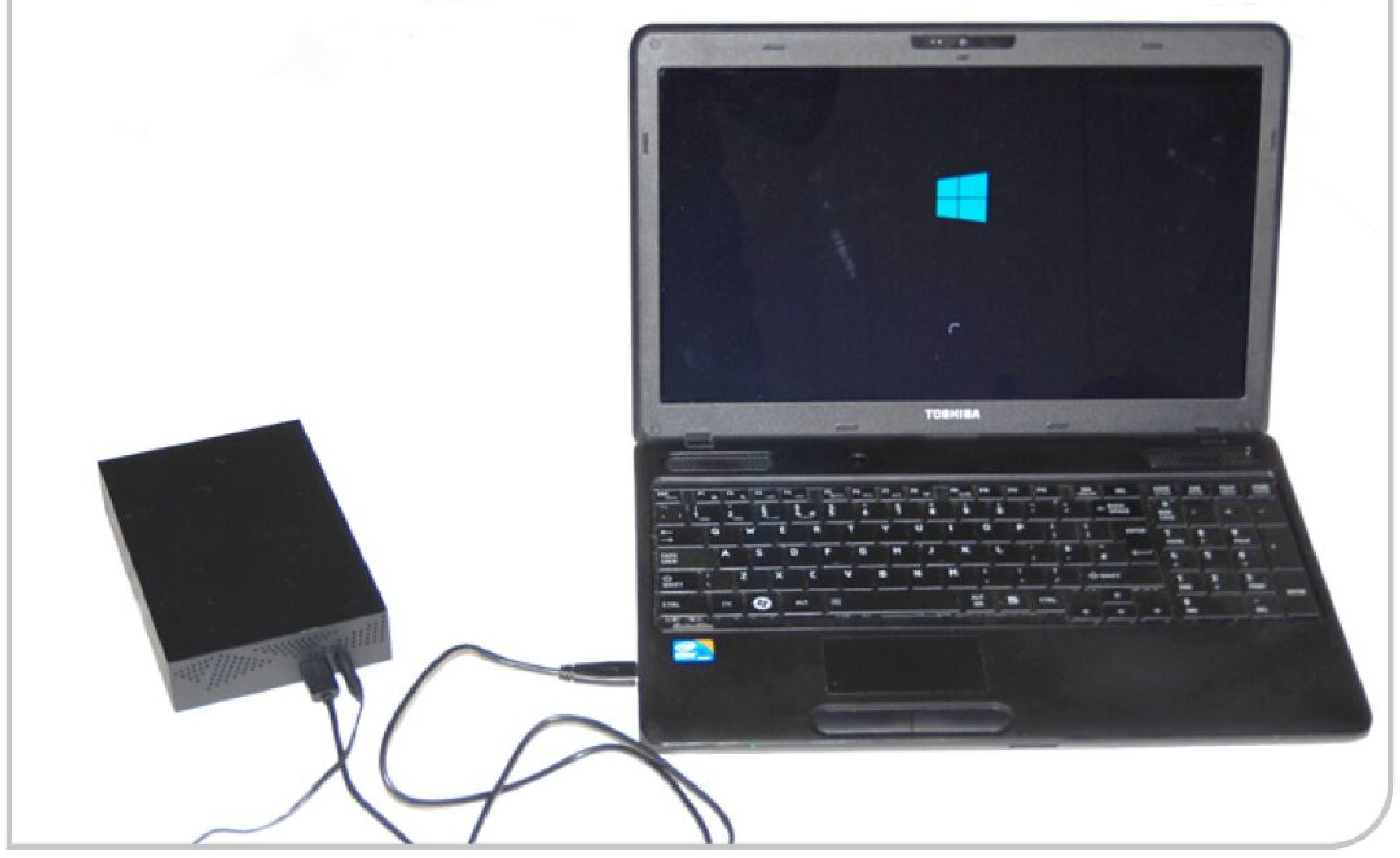
However if you have an established system and want to transfer it onto your new SSD you can do that to by following this tutorial. We'll create something called a "system image", which is a backup copy of your entire system that can be used to re-install the whole system on a new drive; it's also a great way to keep a backup of your system, something that you really should do. In order to do this you'll need an external storage drive large enough to hold everything on your hard drive. You can buy high capacity external hard drives at any good computer store or online retailer. If your system supports USB 3.0 you should get a drive that supports it too, since it greatly speeds up the transfer process. An external drive like this should be on your shopping list anyway, since it's the best way to keep a backup of your important data.

THINGS YOU'LL NEED

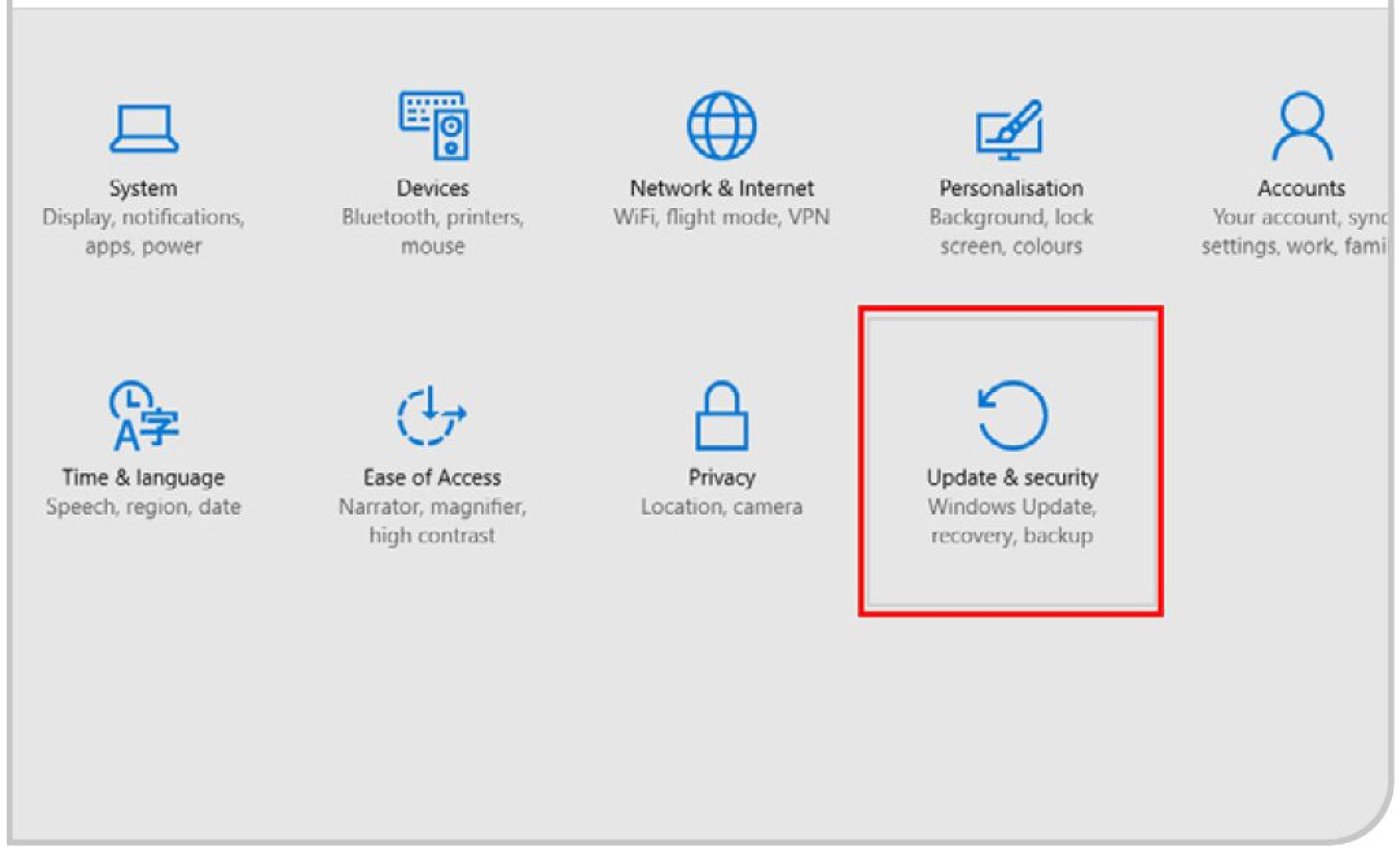
- **A newly installed SSD**
- **An external backup drive of sufficient size**
- **A recordable DVD**
- **A Windows 7/8 installation disc or system repair disc**

Fitting the SSD

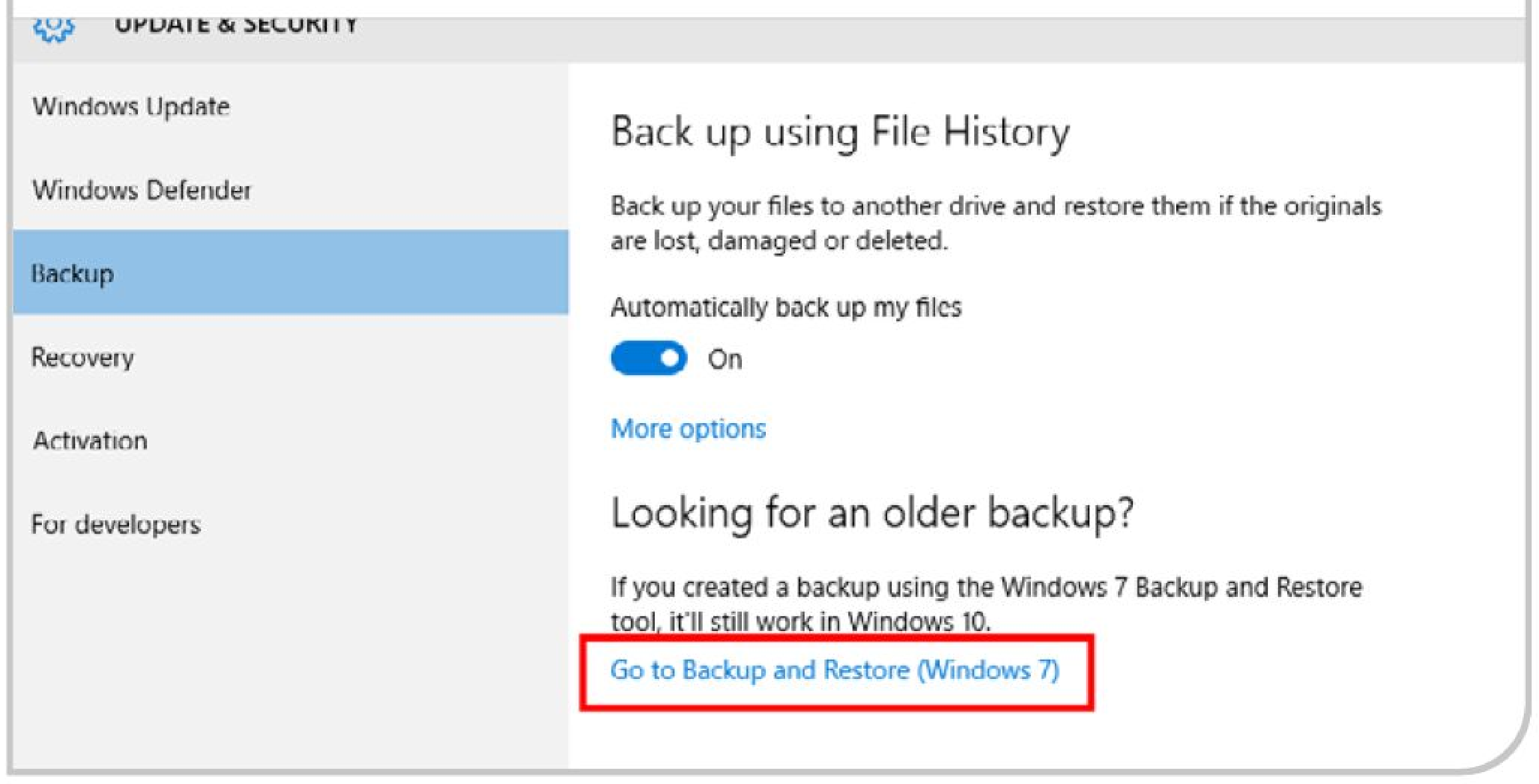
STEP 1 Connect your external backup drive to a USB socket on your PC. The blue USB 3.0 sockets (if you have them) provide much faster data transfer and will speed up the process considerably.



STEP 2 Click on the Start button and then on Settings. On the Settings screen, click on Update & Security.


System
Display, notifications, apps, power
Devices
Bluetooth, printers, mouse
Network & Internet
WiFi, flight mode, VPN
Personalisation
Background, lock screen, colours
Accounts
Your account, sync settings, work, fami
Time & language
Speech, region, date
Ease of Access
Narrator, magnifier, high contrast
Privacy
Location, camera
Update & security
Windows Update, recovery, backup

STEP 3 In the index column on the left of the screen, click on Backup and then on that screen, click on the link and the bottom of the screen "Go to Backup and Restore (Windows 7)".


UPDATE & SECURITY
Windows Update
Windows Defender
Backup
Recovery
Activation
For developers

Back up using File History

Back up your files to another drive and restore them if the originals are lost, damaged or deleted.

Automatically back up my files
On

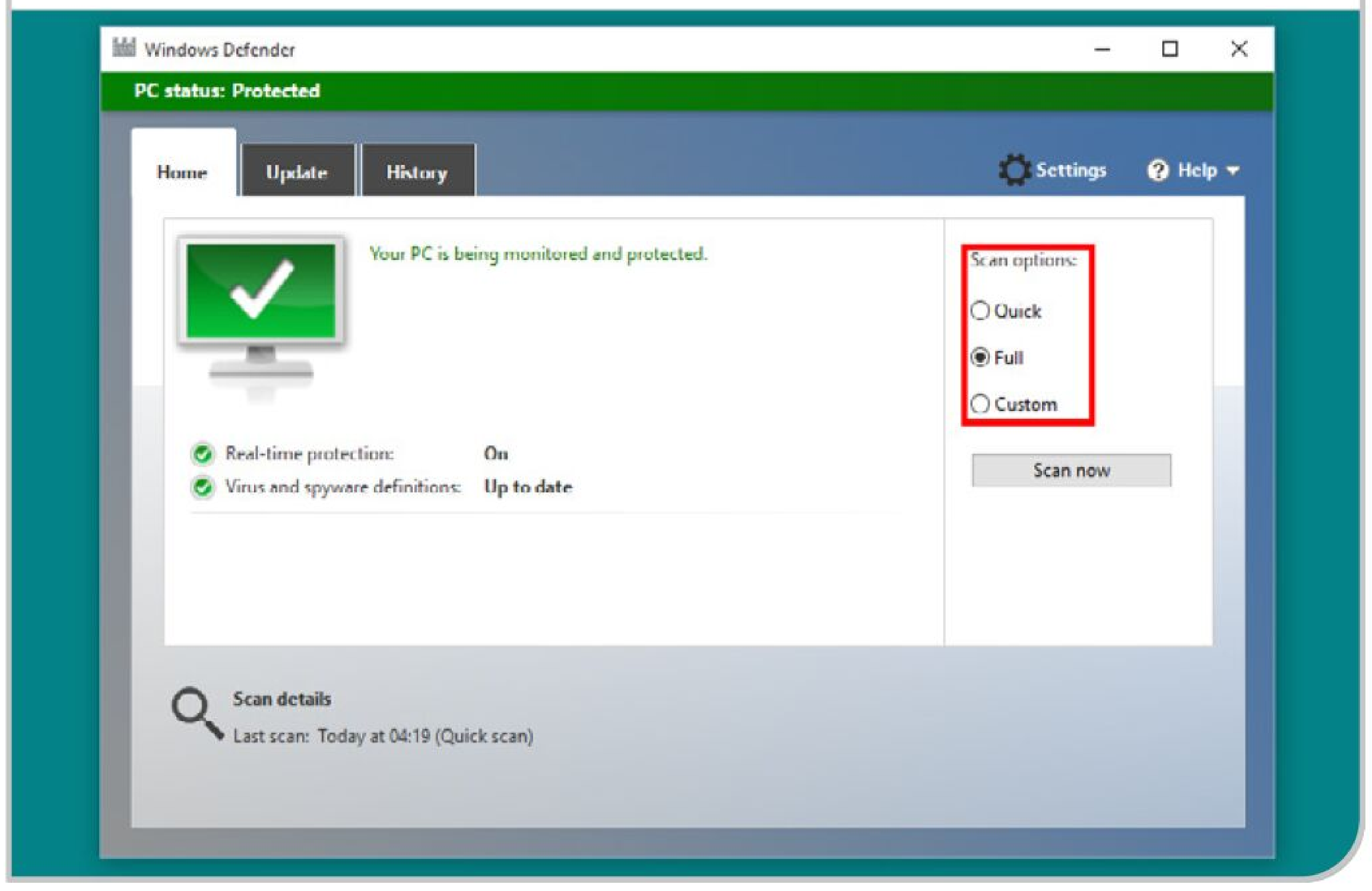
More options

Looking for an older backup?

If you created a backup using the Windows 7 Backup and Restore tool, it'll still work in Windows 10.

Go to Backup and Restore (Windows 7)

STEP 4 If you've used Windows 7 before, the screen that appears should look very familiar. On the left of the screen you'll see "Create a system image"; click on this link.

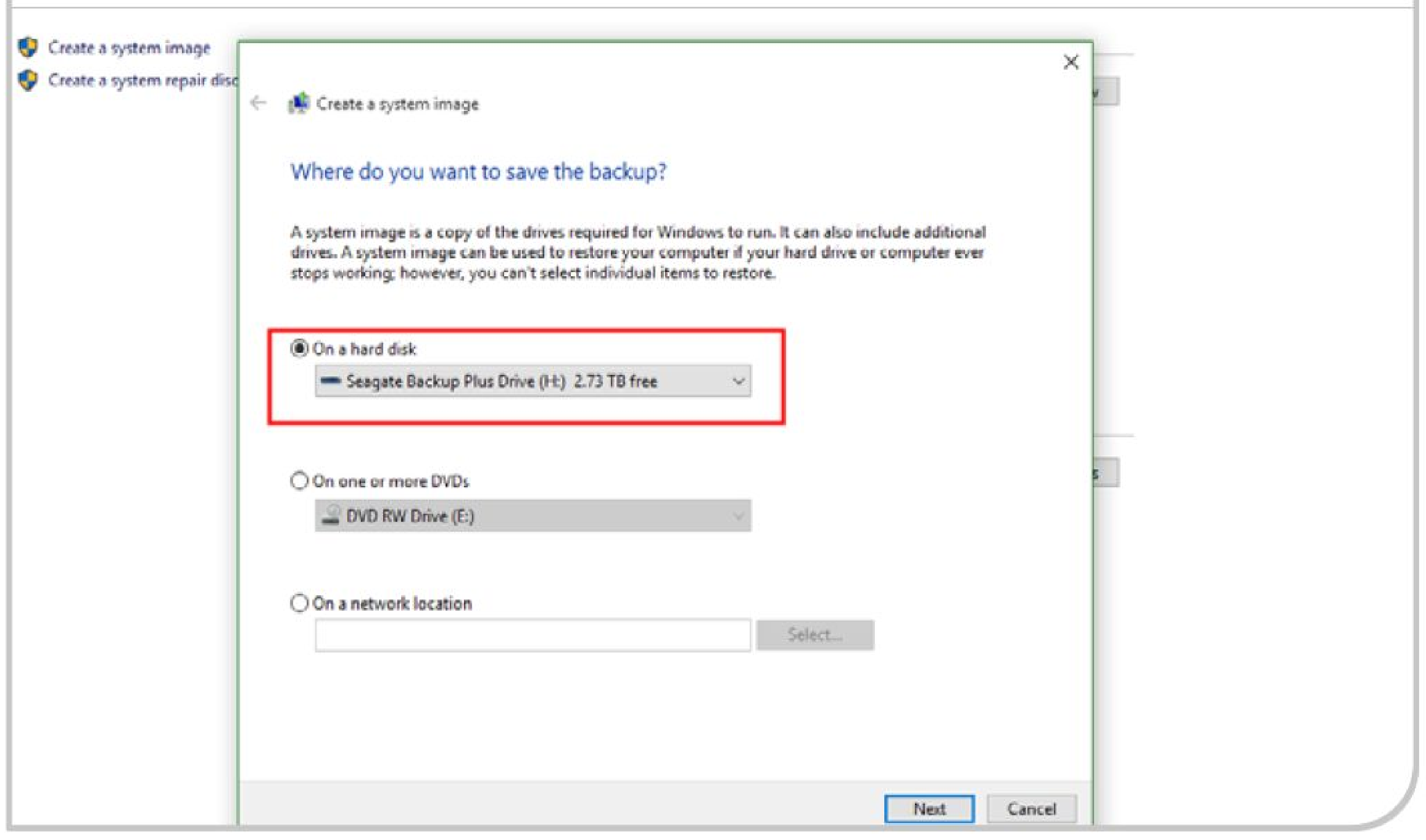

Windows Defender
PC status: Protected
Home
Update
History
Settings
Help
Scan options:
○ Quick
● Full
○ Custom
Scan now
Scan details

Your PC is being monitored and protected.

Real-time protection: On
Virus and spyware definitions: Up to date

Last scan: Today at 04:19 (Quick scan)

STEP 5 The next screen presents you with several options about creating your system image backup. The DVD option is redundant, since it would take dozens of disks. If you have a large network drive available you could use that but we'll use the external HDD.


Create a system image
Create a system repair disc
Create a system image

Where do you want to save the backup?

A system image is a copy of the drives required for Windows to run. It can also include additional drives. A system image can be used to restore your computer if your hard drive or computer ever stops working; however, you can't select individual items to restore.

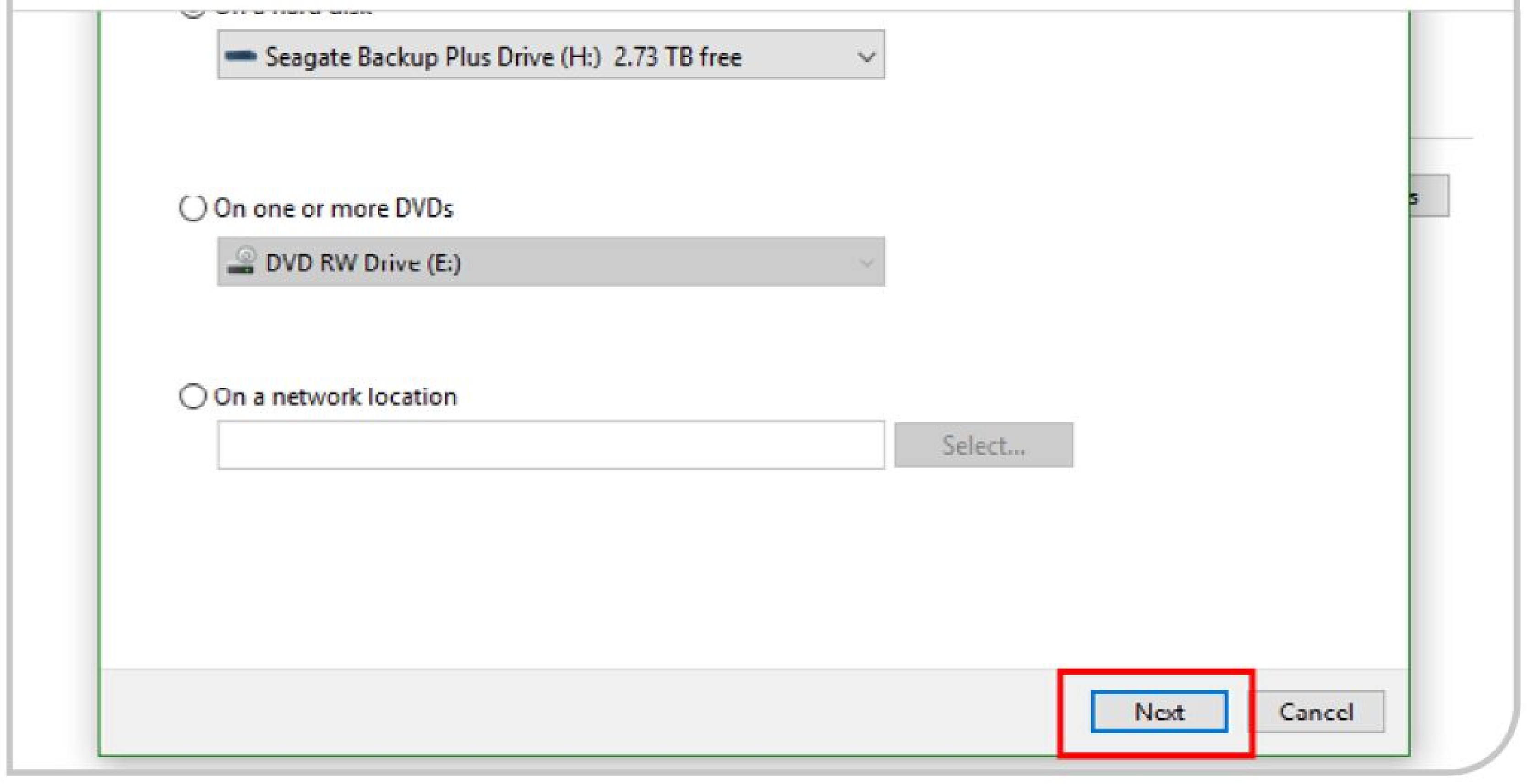
● On a hard disk
Seagate Backup Plus Drive (H:) 2.73 TB free

○ On one or more DVDs
DVD RW Drive (E:)

○ On a network location

Select...
Next
Cancel

STEP 6 Click on the button labelled "On a hard disk" and then click in the window to bring up the drop-down menu. Select the drive that you want to use from the list, then click Next.

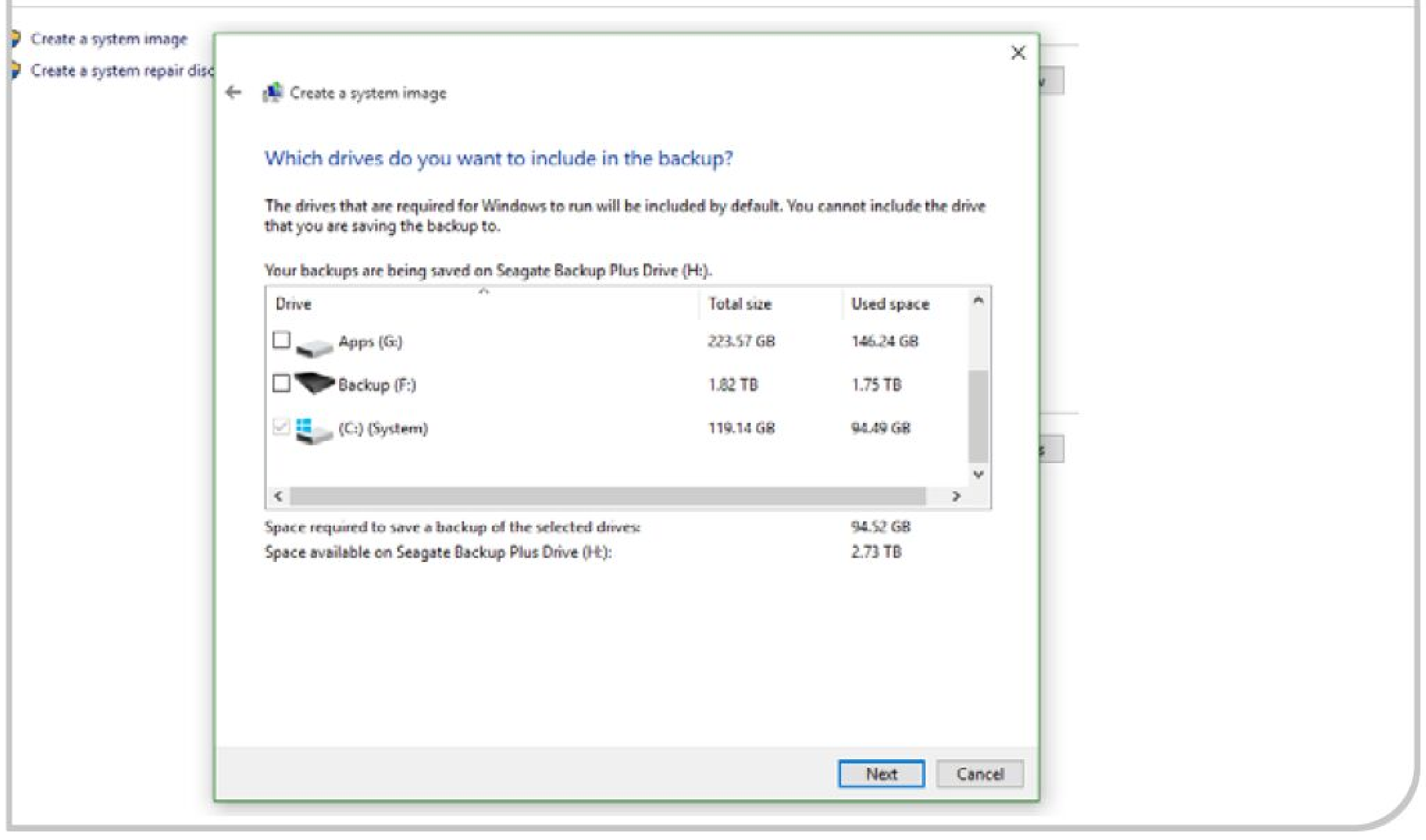

Seagate Backup Plus Drive (H:) 2.73 TB free

○ On one or more DVDs
DVD RW Drive (E:)

○ On a network location

Select...
Next
Cancel

STEP 7 On the next screen you can choose which drives you want to include in the image. If you have more than one, you'll see that the system drive (C:) is pre-selected. To migrate your Windows installation this is all you need.


Create a system image
Create a system repair disc
Create a system image

Which drives do you want to include in the backup?

The drives that are required for Windows to run will be included by default. You cannot include the drive that you are saving the backup to.

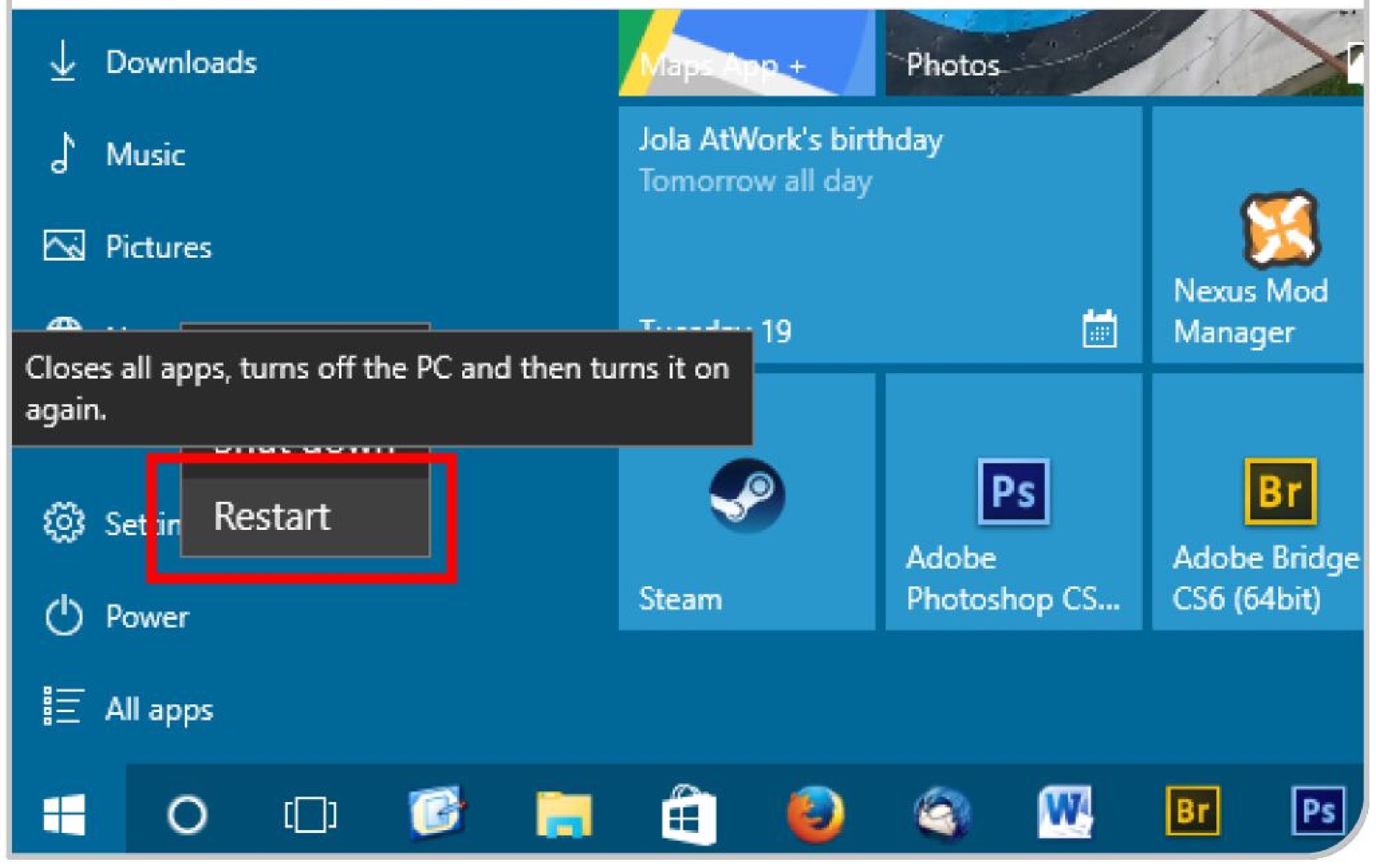
Your backups are being saved on Seagate Backup Plus Drive (H:).

Drive	Total size	Used space
☐ Apps (G:)	223.57 GB	146.24 GB
☐ Backup (F:)	1.82 TB	1.75 TB
☑ (C:) (System)	119.14 GB	94.49 GB

Space required to save a backup of the selected drives: 94.52 GB
Space available on Seagate Backup Plus Drive (H:): 2.73 TB

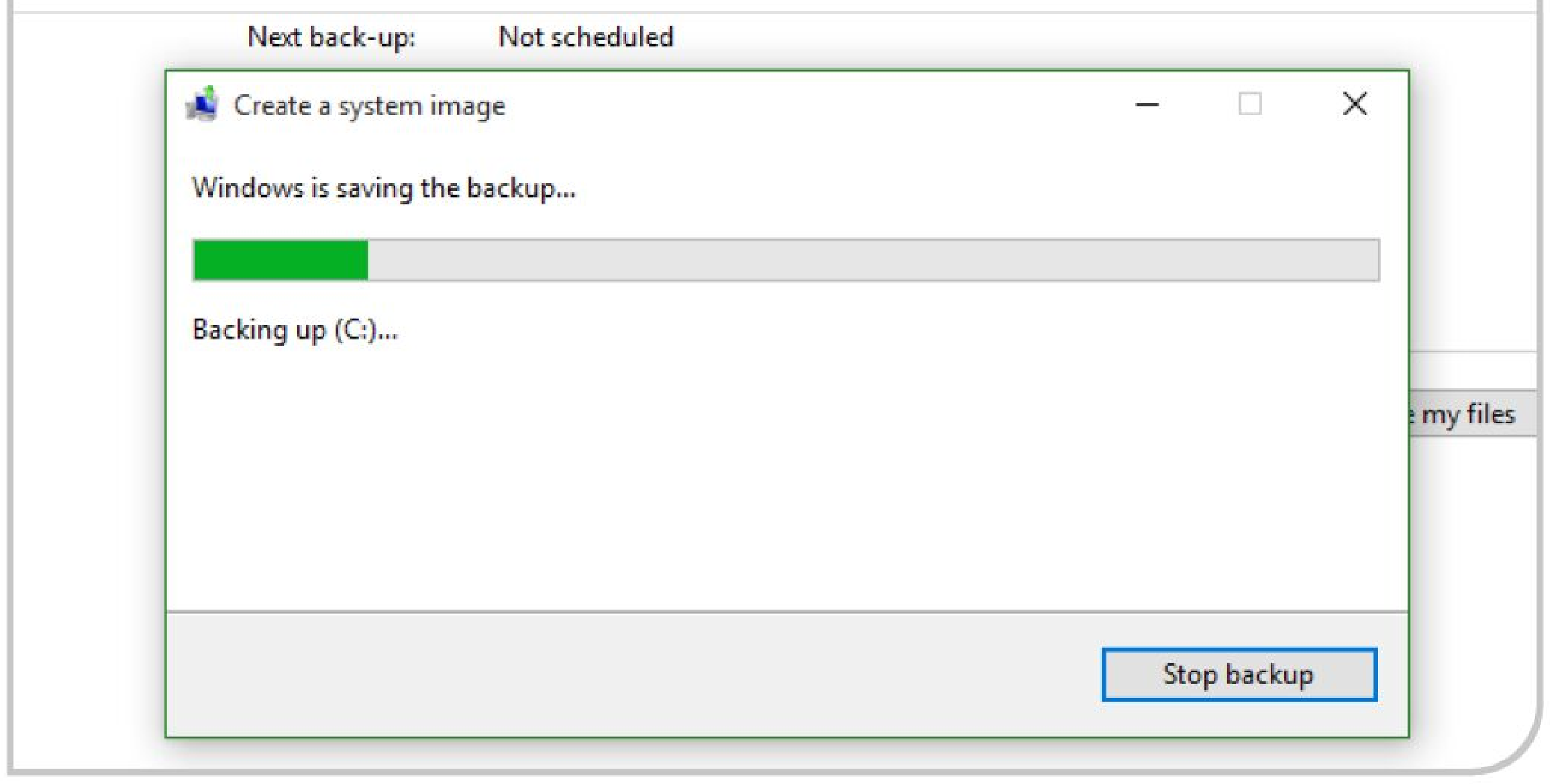
Next
Cancel

STEP 8 Click Next and you'll be taken to a final confirmation screen where your choices are listed. If you're happy with the settings you've chosen, click Start backup.


Downloads
Music
Pictures
Settings
Power
All apps
Maps App +
Photos
Jola AtWork's birthday
Tomorrow all day
Tuesday 19
Nexus Mod Manager
Steam
Adobe Photoshop CS...
Adobe Bridge CS6 (64bit)
Shut down
Restart

Closes all apps, turns off the PC and then turns it on again.

STEP 9 Next you'll have to wait while the backup process proceeds, which will take anywhere from about 15 minutes to a couple of hours depending on the size of your installation and the speed of your backup drive.



Next back-up: Not scheduled

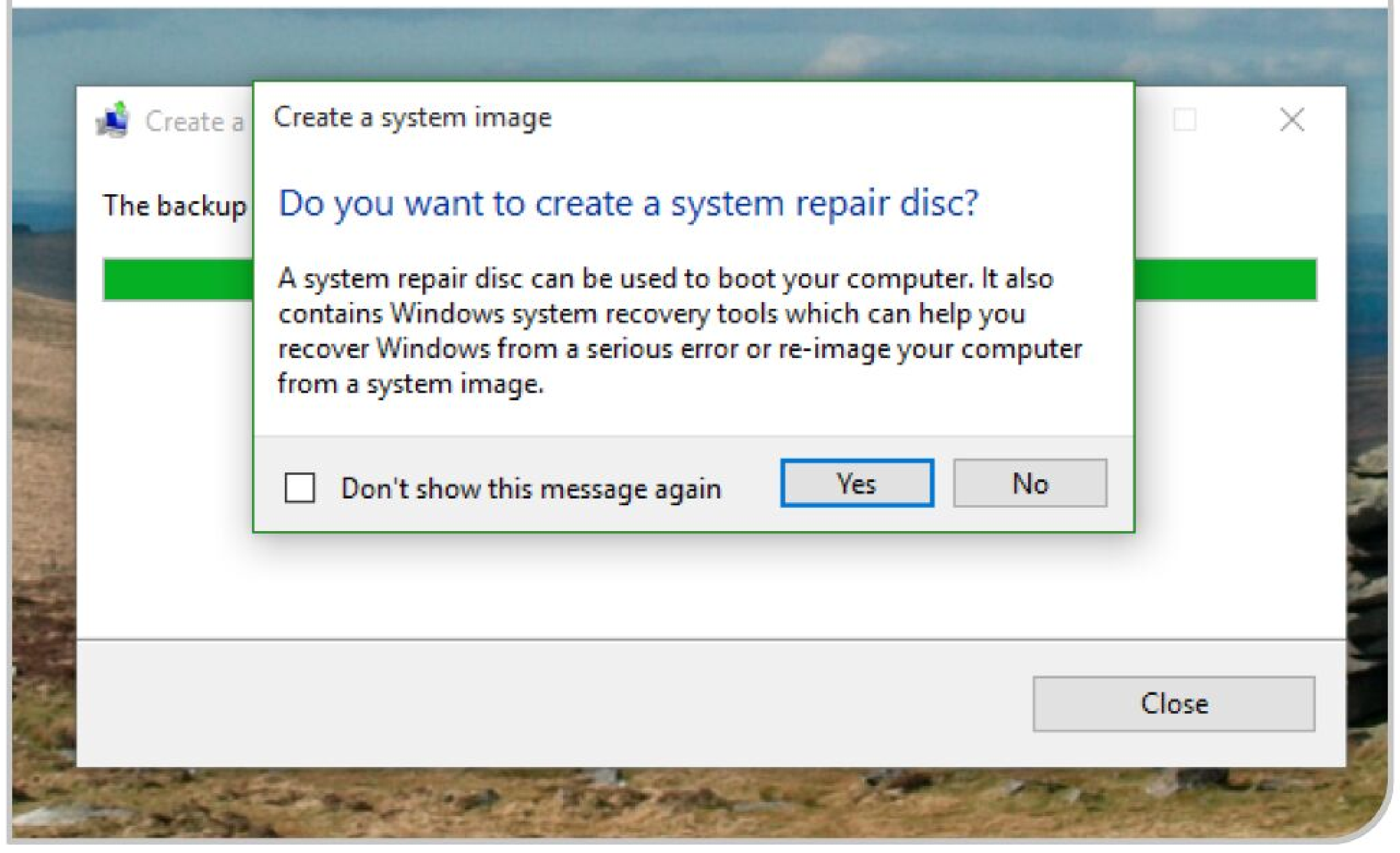
Create a system image

Windows is saving the backup...

Backing up (C:)...

my files
Stop backup

STEP 10 At the end of the backup process you'll be given the option to create a system repair disc. If your PC has a DVD-R drive, put a recordable DVD in and click "Create disc". The process will take a few minutes.



Create a system image

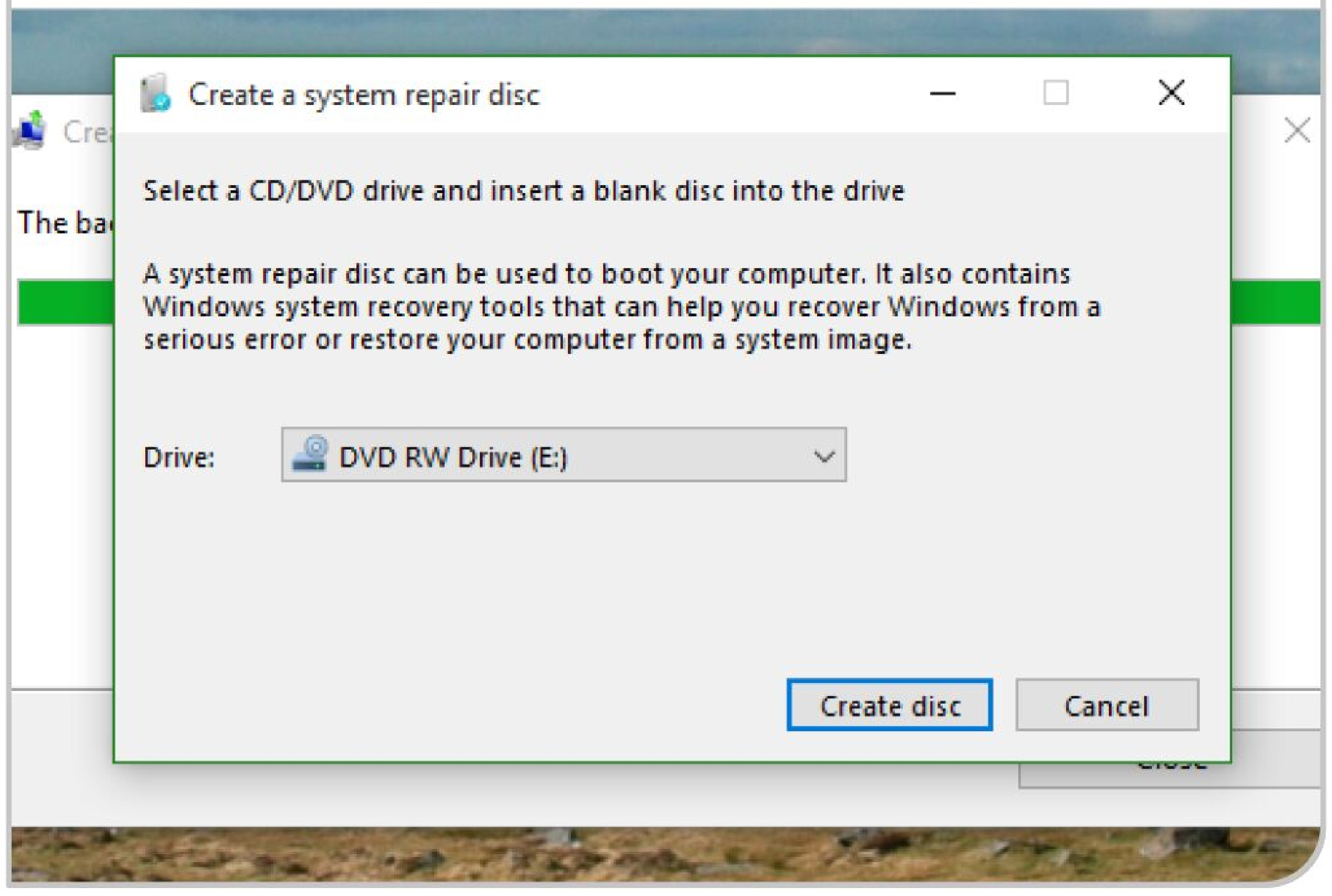
Do you want to create a system repair disc?

A system repair disc can be used to boot your computer. It also contains Windows system recovery tools which can help you recover Windows from a serious error or re-image your computer from a system image.

☐ Don't show this message again

Create a
The backup
Yes
No
Close

STEP 11 Once the disc is complete, take it out and label it "Repair disc - Windows 10". Keep this disc handy because you're going to need it later.



Create a system repair disc

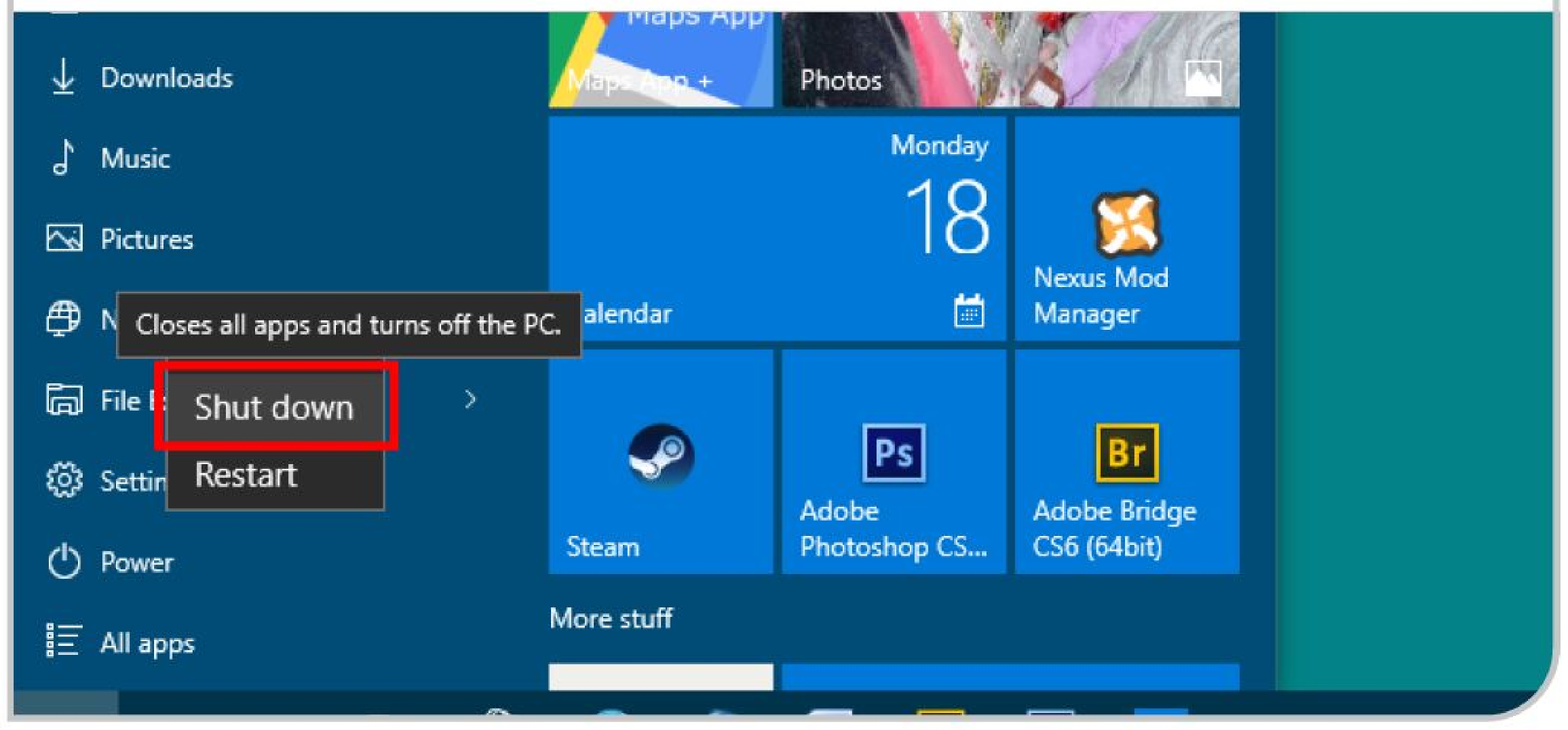
Select a CD/DVD drive and insert a blank disc into the drive

A system repair disc can be used to boot your computer. It also contains Windows system recovery tools that can help you recover Windows from a serious error or restore your computer from a system image.

Drive: DVD RW Drive (E:)

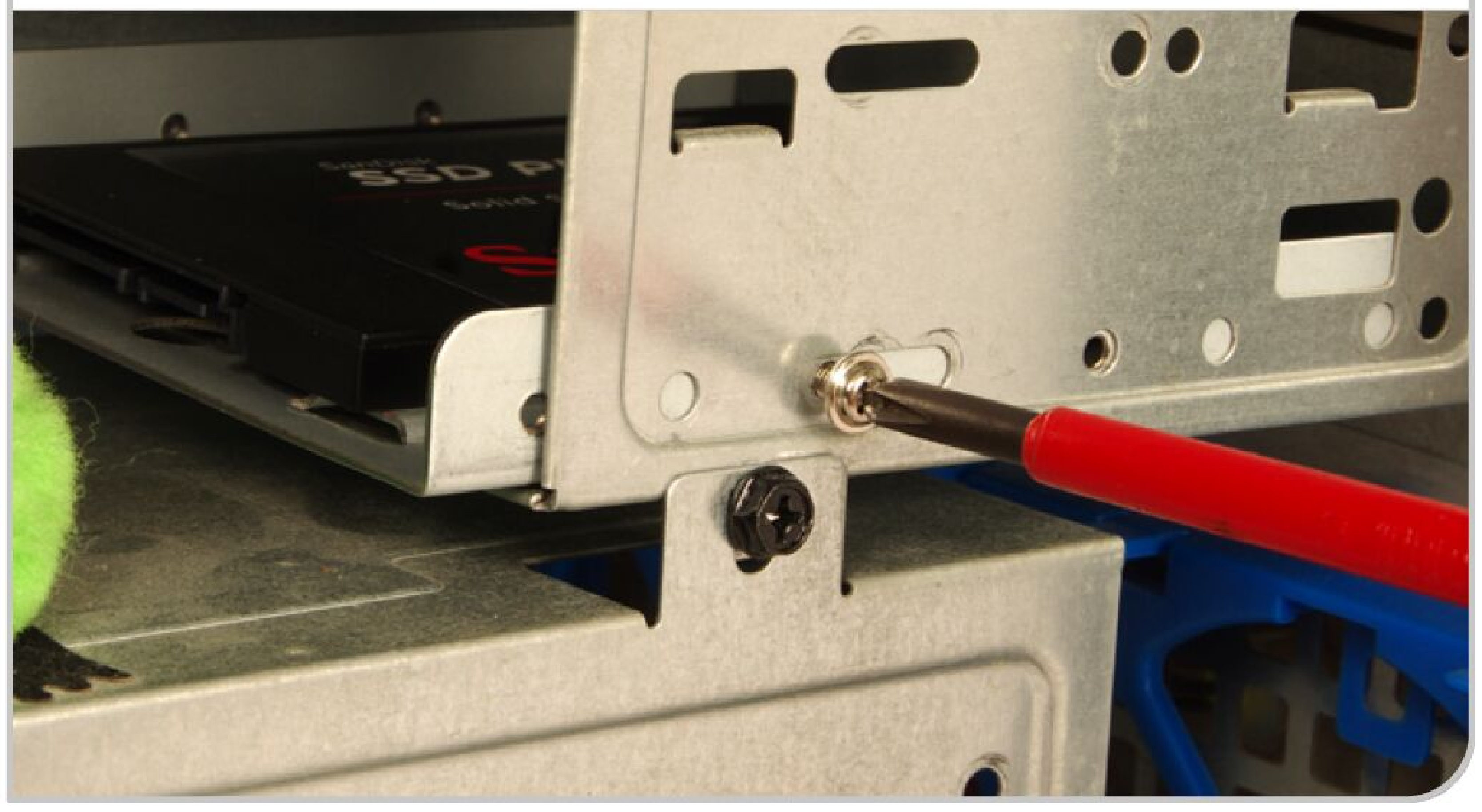
Cre
The ba
Create disc
Cancel

STEP 12 Once the backup and disc recording is complete, switch off and disconnect your backup drive and then shut down your PC. Unplug it from the mains and disconnect all attached devices, such as the monitor, mouse, keyboard and printer.

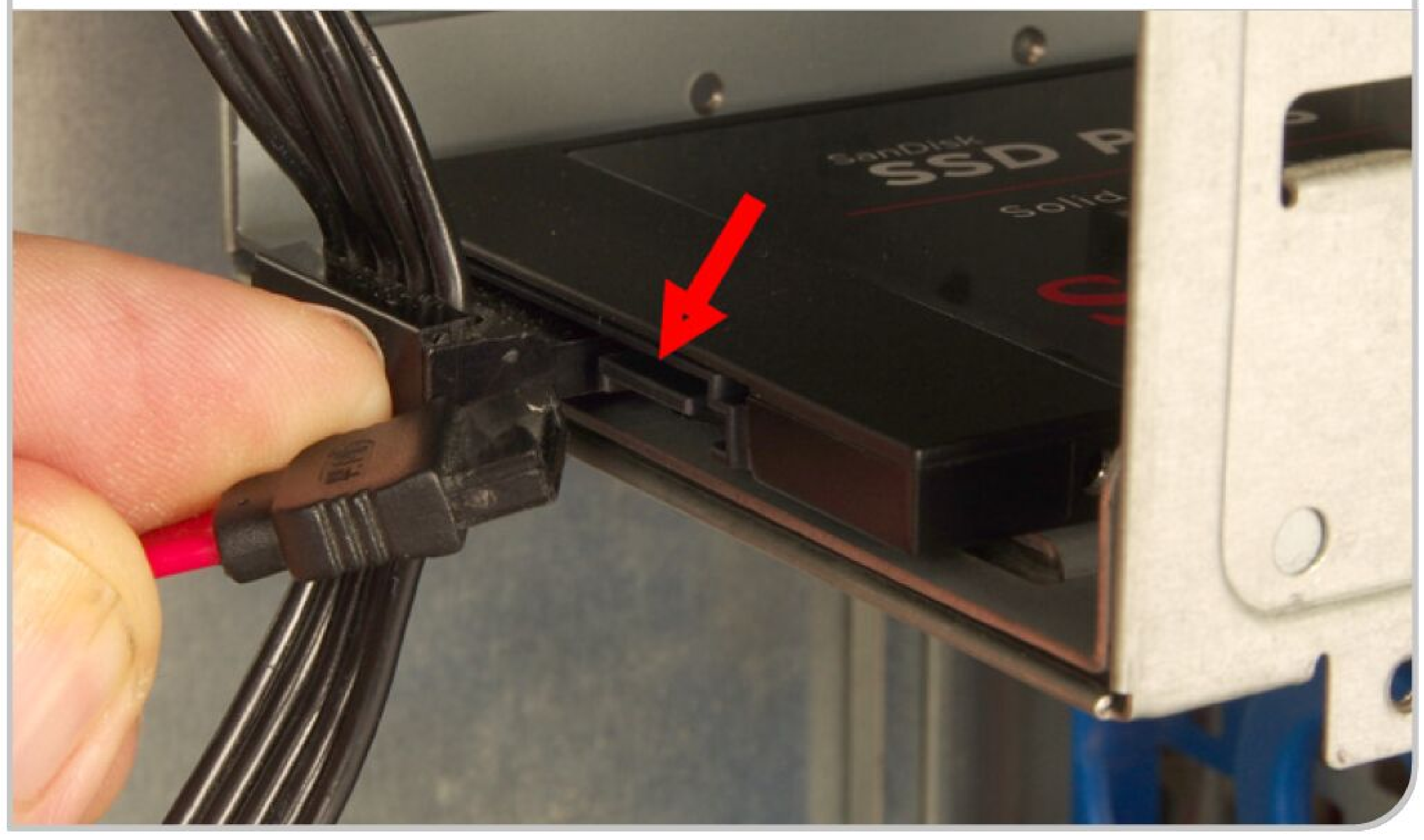


Downloads
Music
Pictures
Closes all apps and turns off the PC.
File
Shut down
Restart
Settin
Power
All apps
Maps App
Photos
Monday
18
Nexus Mod Manager
alendar
Steam
Adobe Photoshop CS...
Adobe Bridge CS6 (64bit)
More stuff

STEP 13 At this point, if you haven't already installed your new SSD, you should do so. Follow the process laid out in the preceding section of this book. While you've got the case open, disconnect, but don't remove, the old HDD that had your Windows system on it.

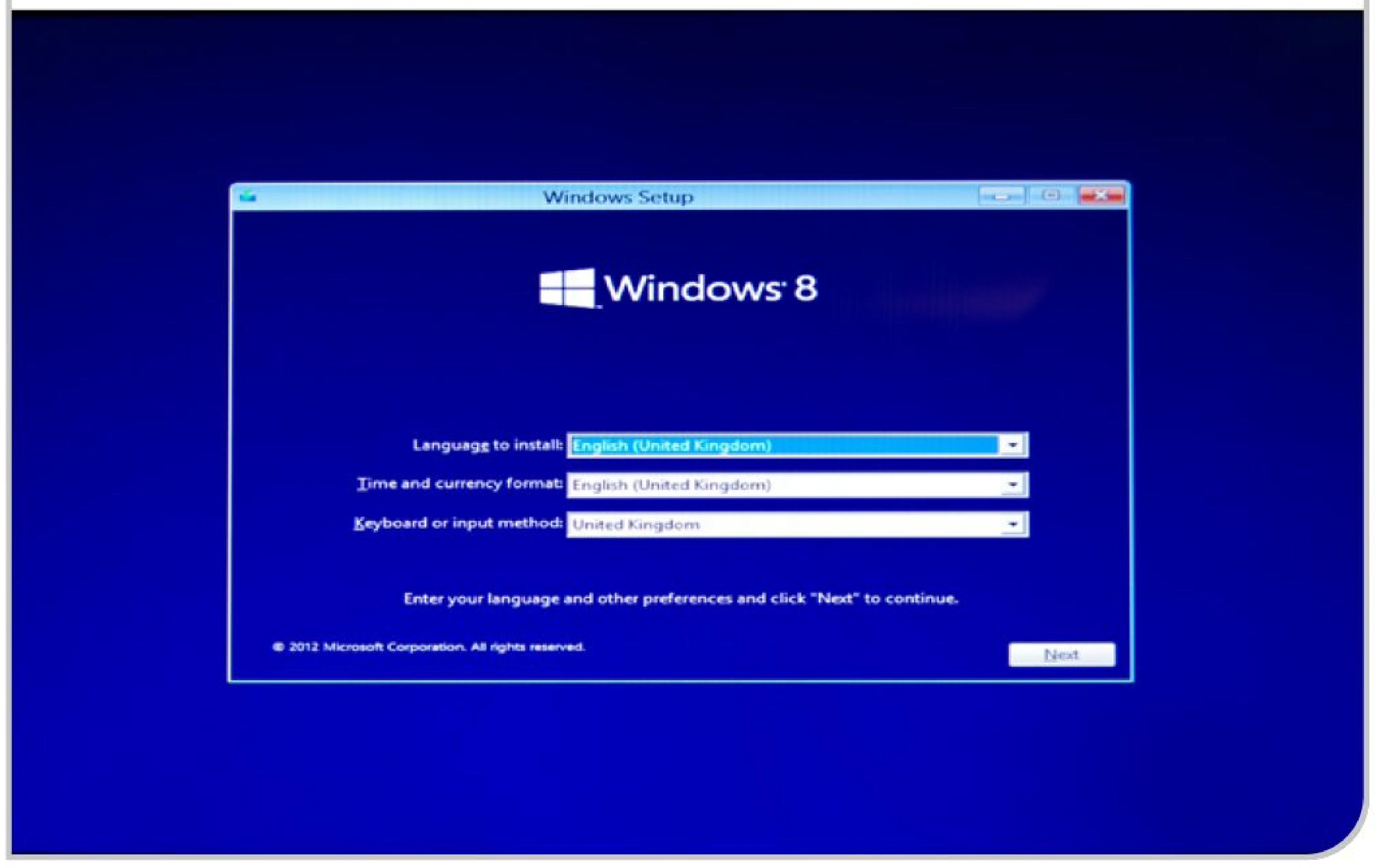


STEP 14 If you've already installed your SSD, open up the PC case again and disconnect the old hard drive. If you don't plan on using the HHD again you can remove it. You'll need a small cross-head screwdriver to undo the screws holding the drive into the bay.



STEP 15 Close up the case, reconnect your devices including the backup drive, plug the mains lead in and switch on the PC. It won't boot up, because the drive containing Windows is now disconnected.

STEP 16 Open the DVD drive and insert your old Windows 7/8 installation disc. Restart your PC and now it will boot up from the disc.



Windows Setup

Windows 8

Language to install: English (United Kingdom)

Time and currency format: English (United Kingdom)

Keyboard or input method: United Kingdom

Enter your language and other preferences and click "Next" to continue.

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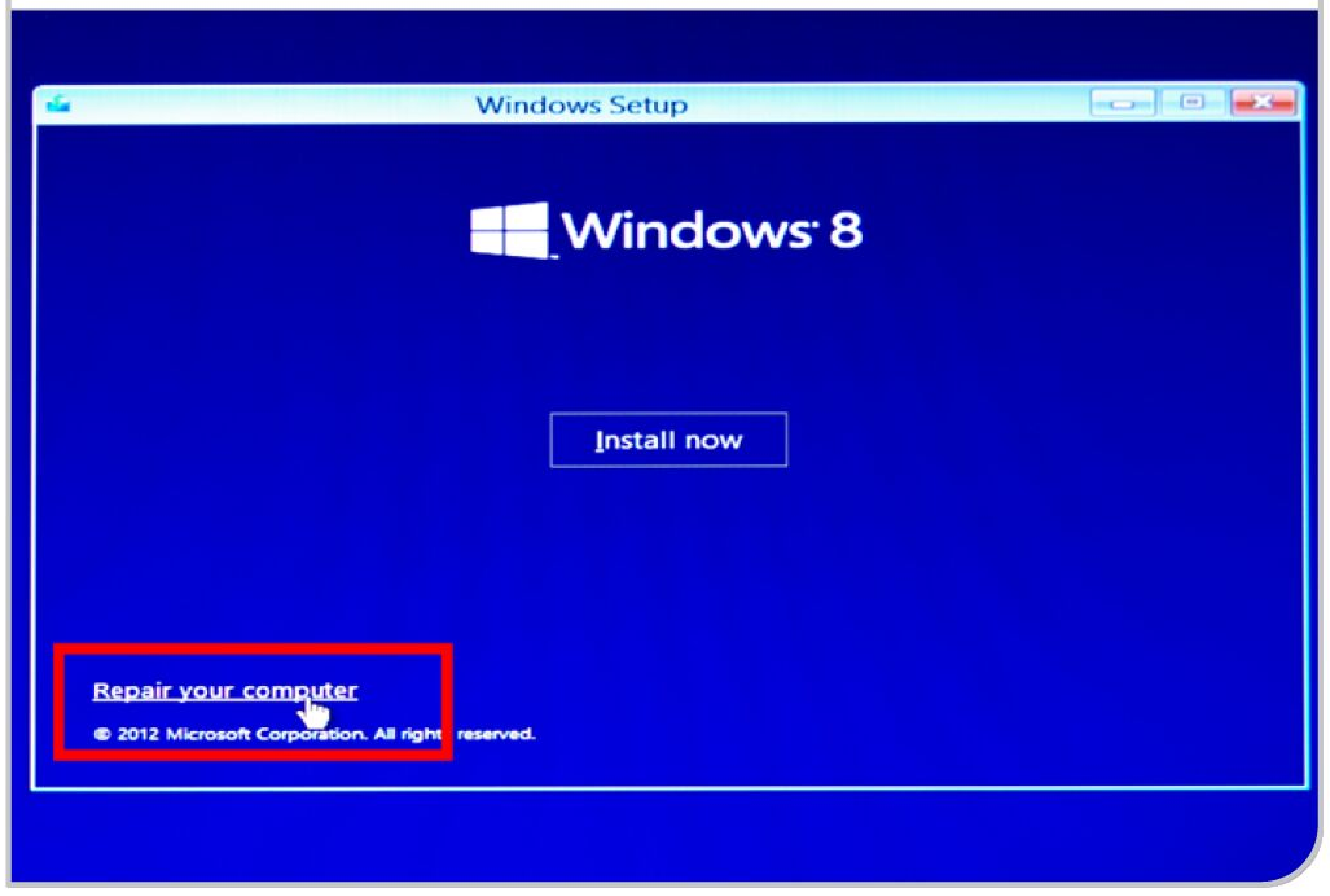
STEP 17 On the second screen of the Windows installation process, click on the "Repair your computer" link at the bottom of the screen.



Windows Setup

Windows 8

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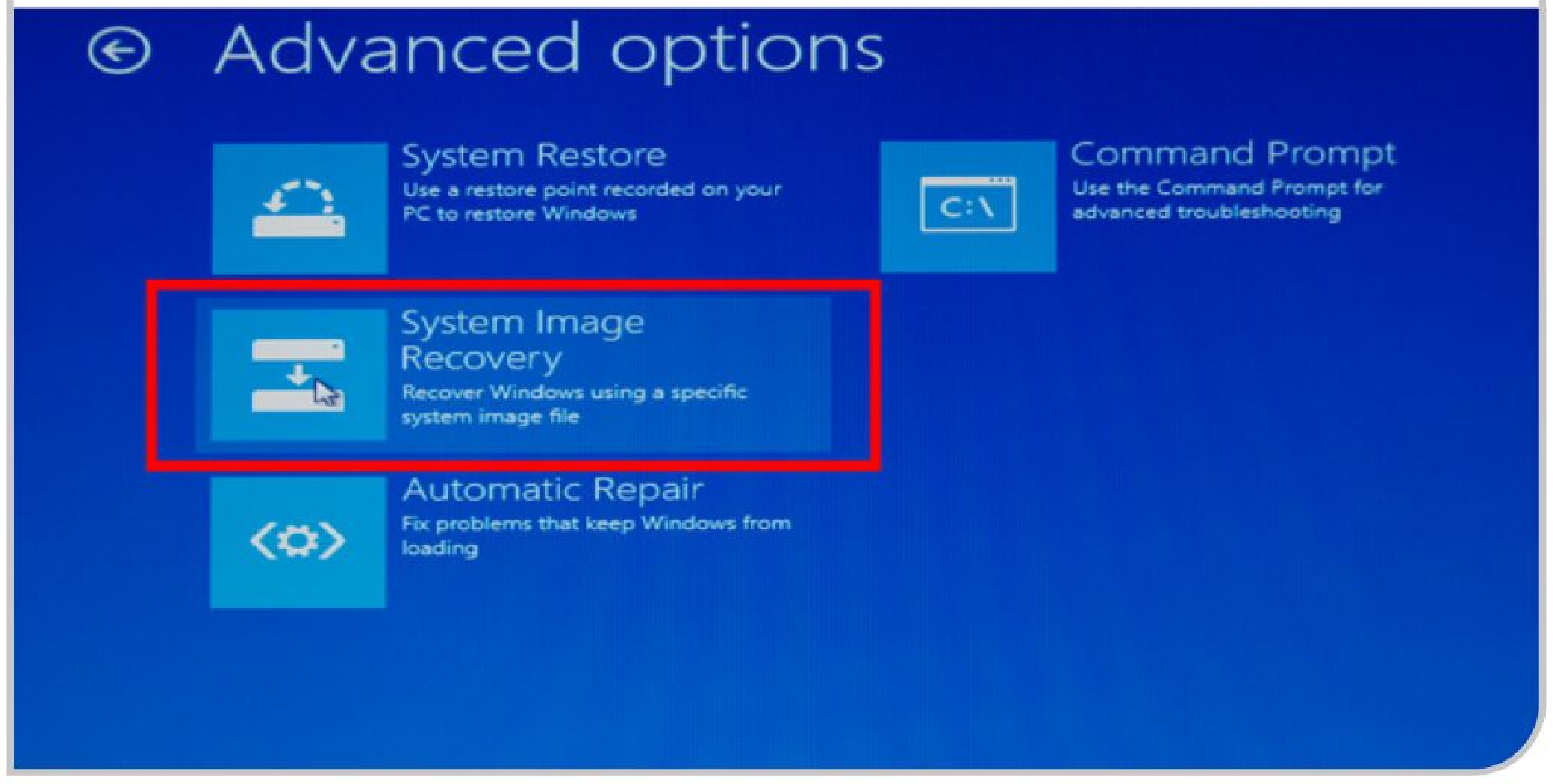
STEP 18 On the next three screens, click on Troubleshoot, then Advanced Options, and then on System Image Recovery. This is where you can restore your Windows system from the disk image you recorded earlier.



Advanced options

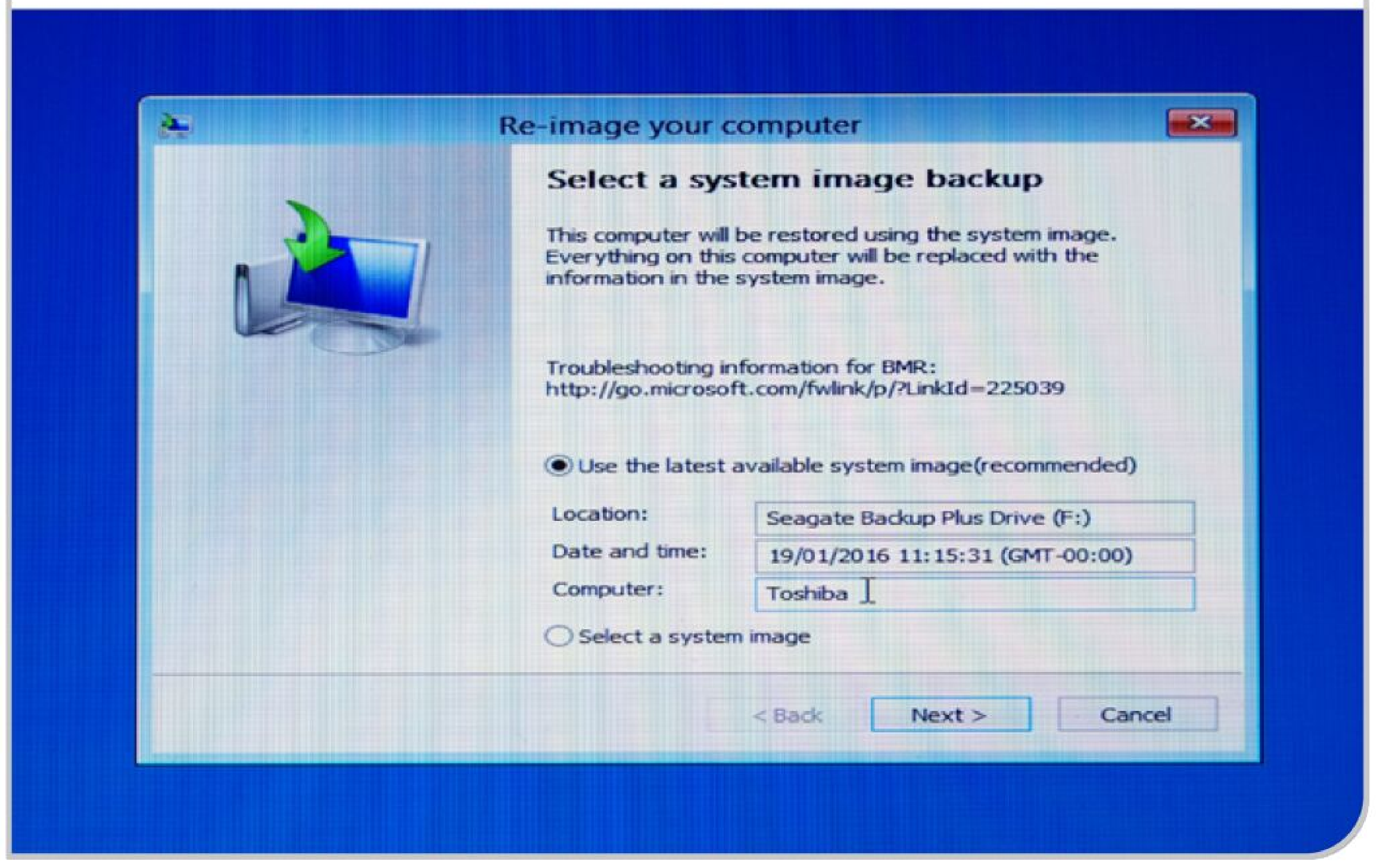
System Restore
Use a restore point recorded on your PC to restore Windows

Command Prompt
Use the Command Prompt for advanced troubleshooting

System Image Recovery
Recover Windows using a specific system image file

Automatic Repair
Fix problems that keep Windows from loading

STEP 19 Windows should automatically detect the system image on the connected backup drive. Check that the settings are correct and click Next.



Re-image your computer

Select a system image backup

This computer will be restored using the system image. Everything on this computer will be replaced with the information in the system image.

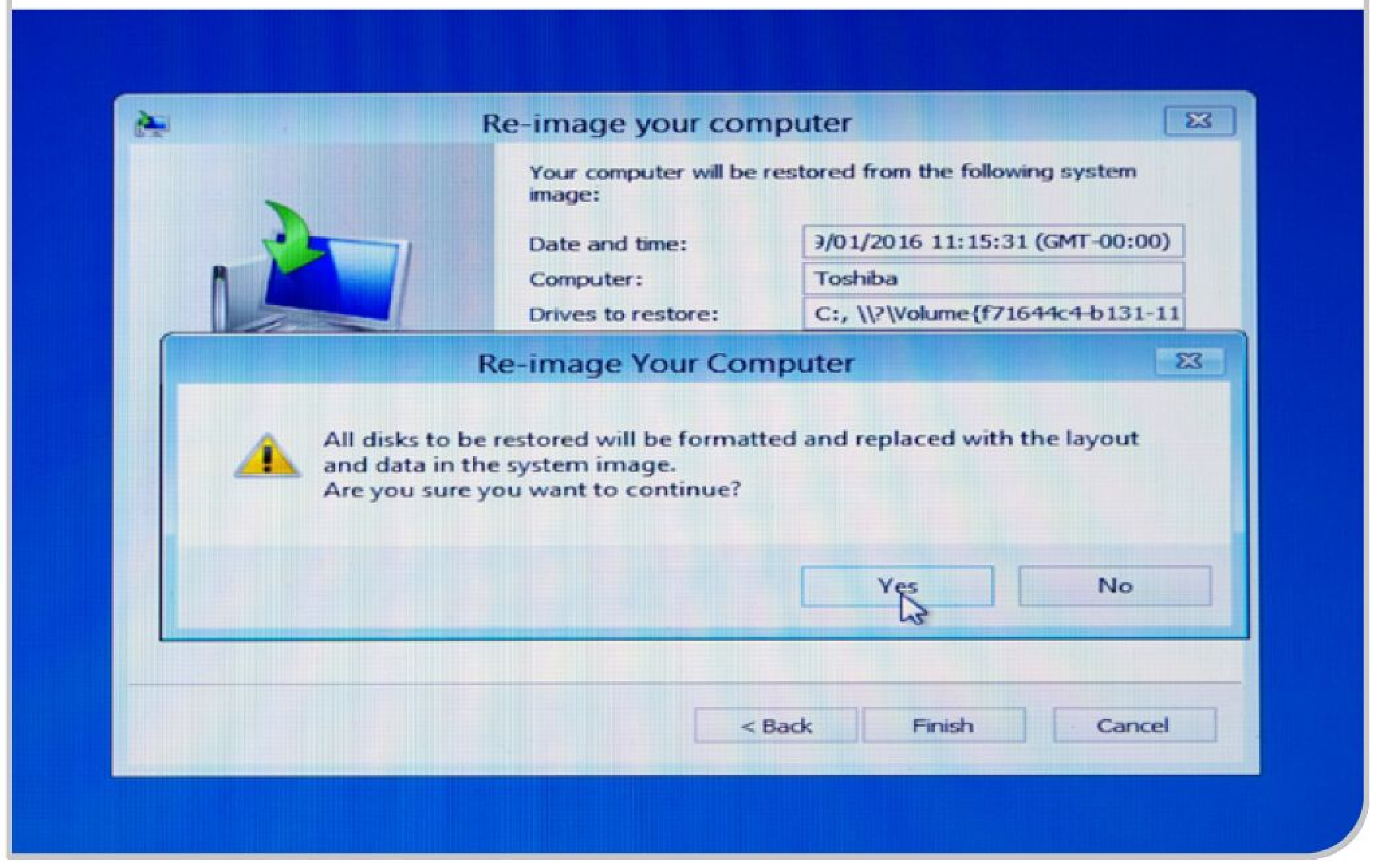
Troubleshooting information for BMR:
http://go.microsoft.com/fwlink/p/?LinkId=225039

● Use the latest available system image(recommended)

Location: Seagate Backup Plus Drive (F:)
Date and time: 19/01/2016 11:15:31 (GMT-00:00)
Computer: Toshiba

○ Select a system image

STEP 20 After a final confirmation that you want to proceed, Windows will set about restoring your system onto your new SSD. The process will take a while, but when it's done Windows should re-start normally.



Re-image your computer

Your computer will be restored from the following system image:

Date and time: 9/01/2016 11:15:31 (GMT-00:00)
Computer: Toshiba
Drives to restore: C:, \\?\Volume{f71644c4-b131-11

Re-image Your Computer

All disks to be restored will be formatted and replaced with the layout and data in the system image.
Are you sure you want to continue?

Choosing Linux

There are lots of versions, known as "Distributions", of Linux available. Each has a different ethos and approach and each will offer the user a different set of features and tools. If you are considering using Linux instead of Windows on your PC, here is a look at the five most popular, and probably the best supported, distributions available and where you can get them.

Choosing a Distribution

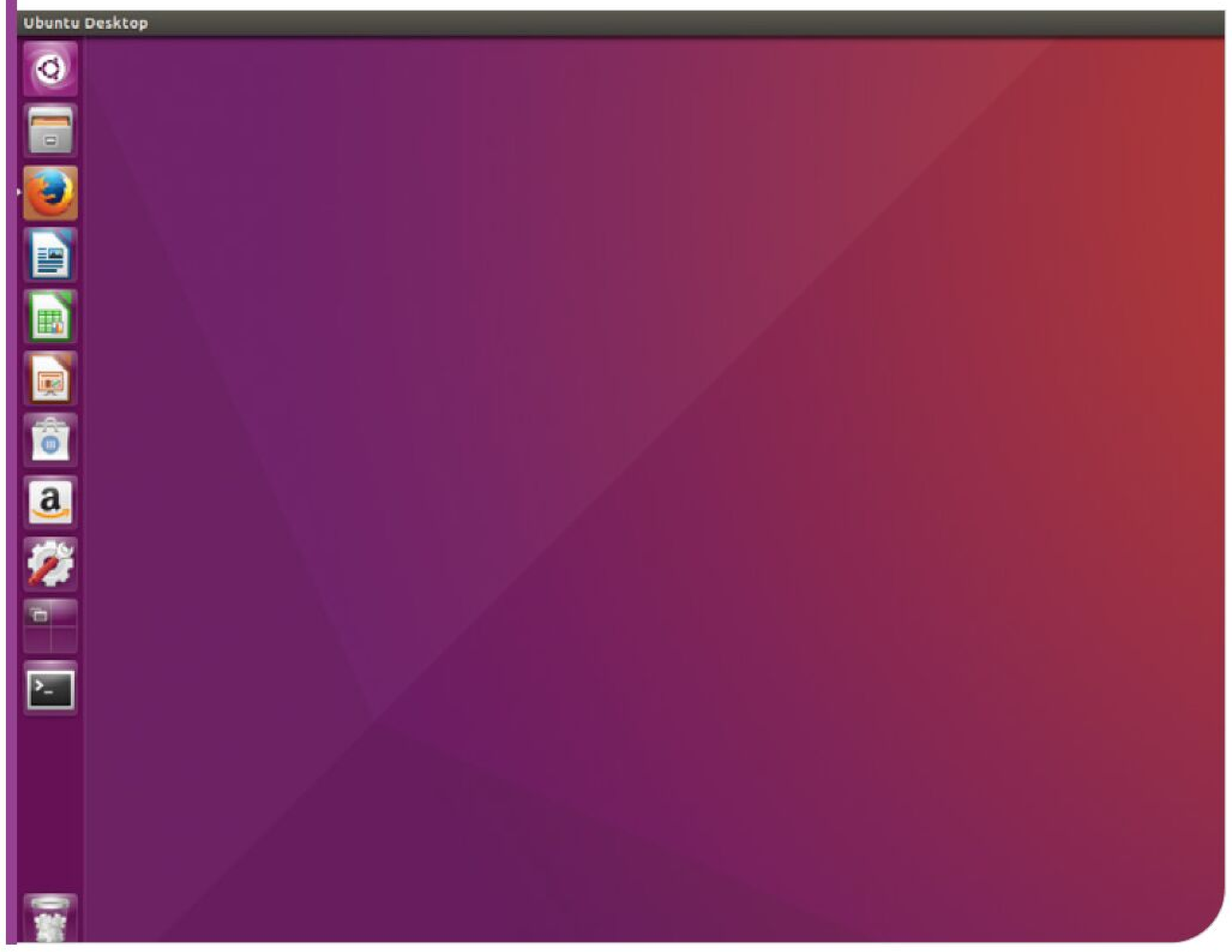
Installing a Linux distribution on your new PC is not something everyone will want to do and even those who choose this route will probably want something similar to Windows.

UBUNTU

Ubuntu is one of the most prolific Linux distributions and the one we suggest beginners use. "Ubuntu" is an ancient African word meaning "humanity to others". The Ubuntu distribution brings the spirit of Ubuntu to the computer world. It's a comprehensive distribution with everything you need to get going. It comes with an office suite, web browser, email and media apps and an app store.

The interface known as "Unity" is reminiscent of OS X, with a Launcher on the side used to open and switch between programs; also there's the Dash for searching and new HUD interface which augments the traditional menu.

You can try out Ubuntu without installing it, by running it directly from a DVD or USB Flash Drive. It's developed in the UK by Canonical, who generates money through tech support. So while it's free to install, Ubuntu is professionally funded. Not everybody is a fan and many Linux users find it a bit too colourful and feature rich. We think it's the best place for beginners to start though and a friendly way to get up and running with Linux.



MINT

Linux Mint began back in 2006 and was based on Ubuntu but it took a different direction. It was developed as an alternative to Ubuntu and soon it started to incorporate the slick interface it has today. The main reason people use Mint is because it offers different desktop options upon installation. The most popular is Cinnamon but MATE, KDE and Xfce are also options. Cinnamon is more similar to the Windows interface, which makes Mint with Cinnamon a popular option for those migrating to Linux from Windows. While you can install different desktop environments on Ubuntu, or any Linux system, it's easier to swap out desktop environments in Mint than Ubuntu.

Another interesting touch is that Mint includes proprietary non-Open Source software, which most Linux installations avoid. While questionable in the community, it does give you built-in software like VLC, a powerful video player, rather than having to install it afterwards.

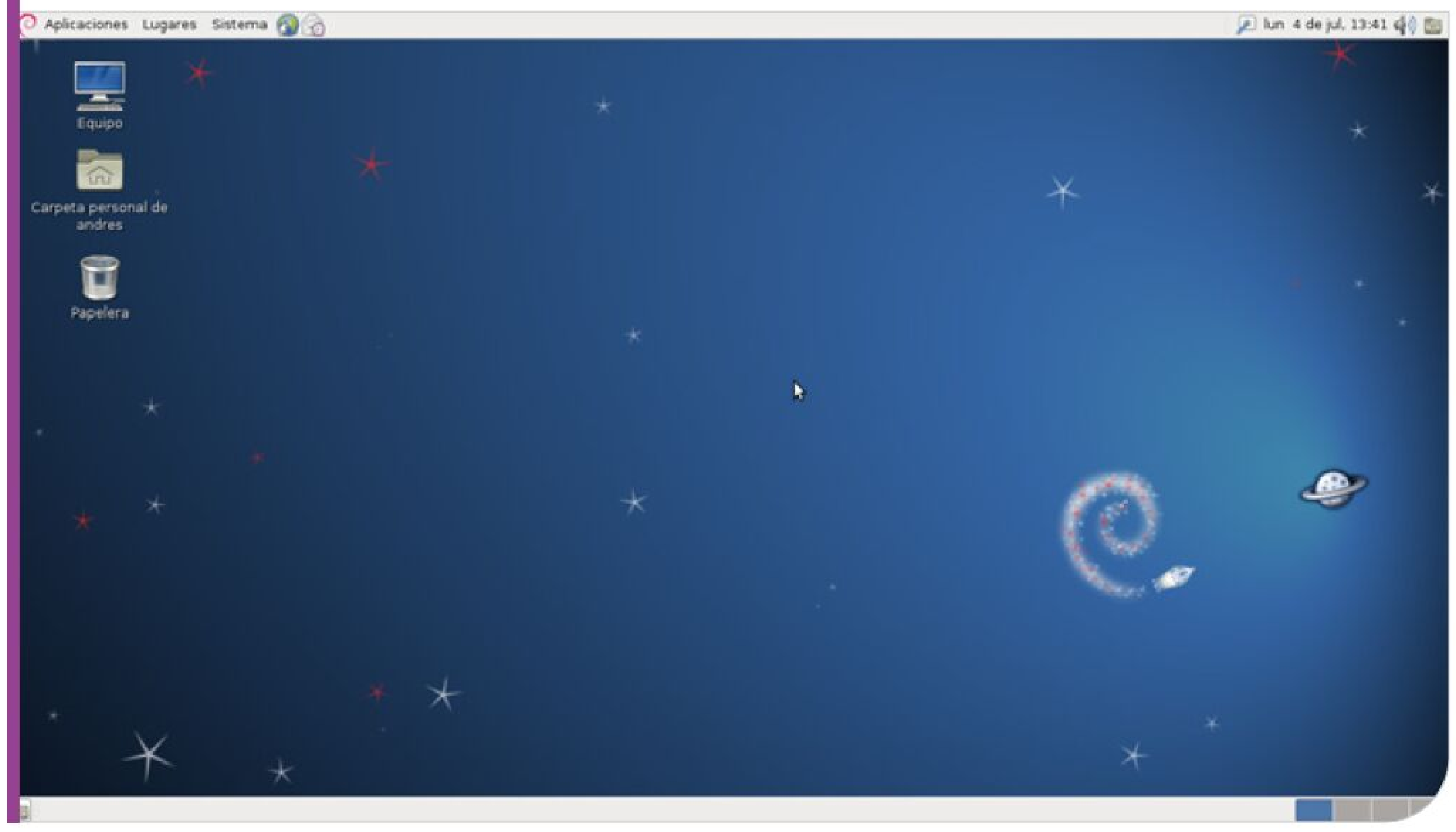
LinuxMint
17.3

DEBIAN

Debian is one of longest running Linux distributions and forms the basis of many other versions of Linux, including Ubuntu. So why install Ubuntu, when you can go for Debian? Many users do exactly that but it's not ideal for beginners. Ubuntu and Mint both offer an easier installation path and come with software packages that will help you get started.

Debian on the other hand, is a much more bare bones affair. It is committed to free software and its repositories contain over 50,000 apps to install. You can install multiple different Desktop environments, although it doesn't support Unity.

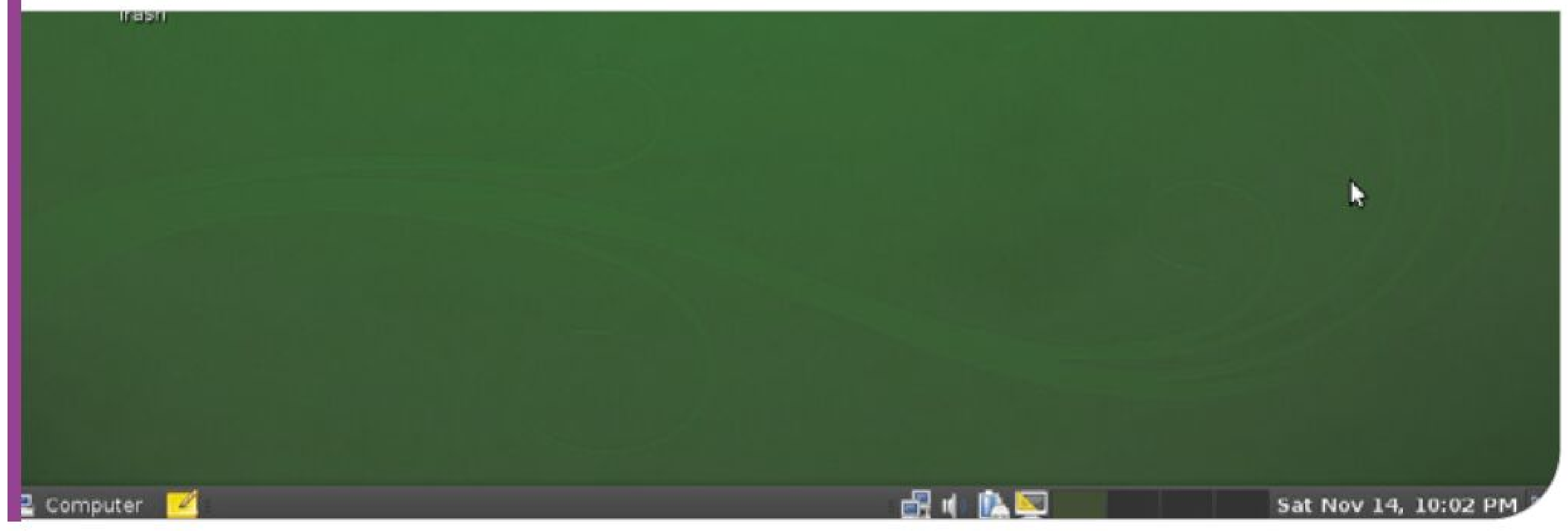
In many ways Debian and Ubuntu are complete opposites. Ubuntu is for beginners while Debian is for total experts. With this in mind, we don't expect, or encourage, you to start with Debian. Instead you should kick off with Ubuntu, then try out Mint and then work with Debian or other distributions.



openSUSE

Most Linux distributions fall into two camps. There are ones with the latest features and technology like Ubuntu and Mint and those with few new features but rock solid reliability, like Debian. Meanwhile openSUSE attempts to cover both bases. OpenSUSE Leap is a rock solid system. It's developed openly by a community along with SUSE employees, who develop an enterprise level operating system: SUSE. This powers the London Stock Exchange amongst other things. It is designed for mission critical environments where "there is no scope for instability".

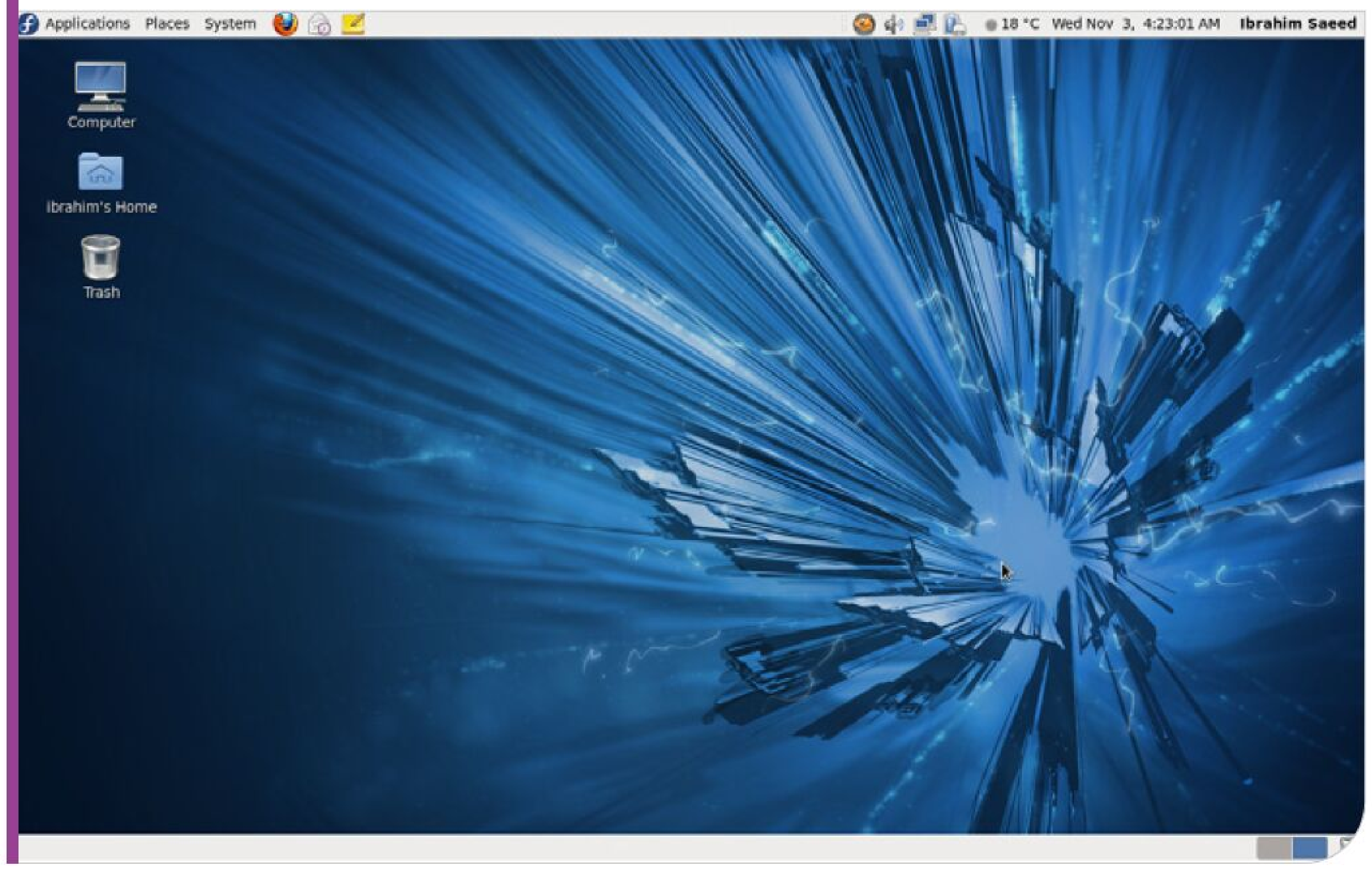
If you find all that too sensible, openSUSE Tumbleweed is a rolling release with all the latest features and the occasional crash. It is a highly respected Linux distribution and many of its core contributors work on the Linux Kernel, LibreOffice, Gnome and other key Linux areas. In short, openSUSE is where you'll find the pros hanging out.



FEDORA

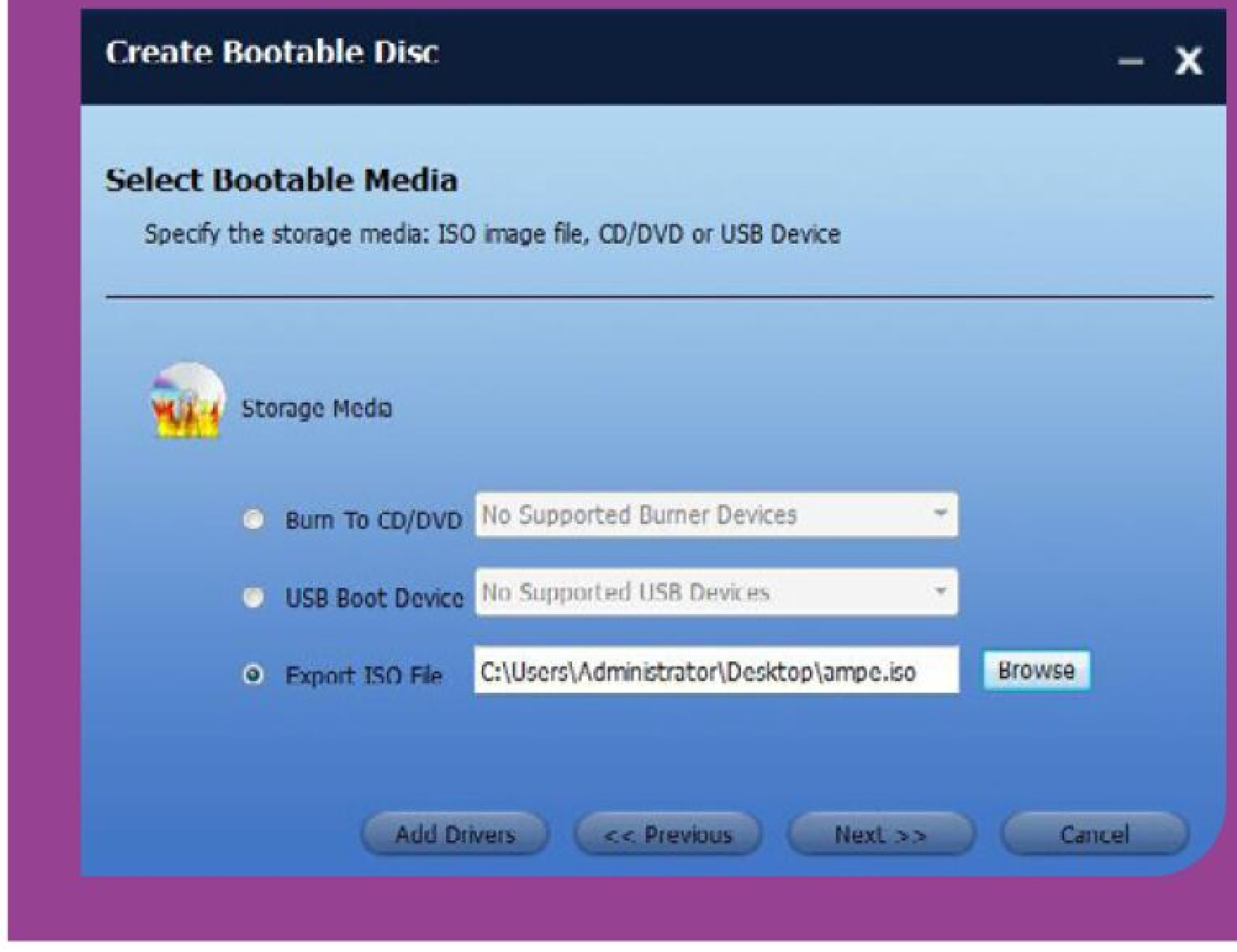
Fedora is sponsored by Red Hat, one of the bigger names in Linux development. It has an estimated 1.2 million users and quite a bit of kudos because Linus Torvalds, creator of the Linux kernel, uses Fedora on all of his computers. While openSUSE and Debian are rock solid, Fedora is a bit more fly-by-your-pants system with a focus on introducing new technology early and often. Consequently each release has a relatively short lifespan, with support between each version lasting around a year.

Many of the features introduced in Fedora roll out to Ubuntu and other distributions down the line. A good example is Gnome Software, which is replacing Ubuntu Software Centre in Ubuntu 16.04. To Fedora users, other Linux distributions just feel like old versions of their software.
Mind you, Fedora users pay with a lack of long term support and reliability issues too. Using Fedora often feels like a permanent repair job, there's always something going wrong.


Applications Places System
18 °C Wed Nov 3, 4:23:01 AM Ibrahim Saeed
Computer
Ibrahim's Home
Trash

INSTALLING LINUX

The installation process for most distributions is similar. You download a disk image from the website and burn it to an optical disk or create a USB Flash Drive installer. Just be careful to get the right distribution for your hardware and read the instructions carefully. Each of the home pages for the different distributions here will have specific instructions for download and installation.



Create Bootable Disc

Select Bootable Media

Specify the storage media: ISO image file, CD/DVD or USB Device

Storage Media

○ Burn To CD/DVD: No Supported Burner Devices
○ USB Boot Device: No Supported USB Devices
● Export ISO File: C:\Users\Administrator\Desktop\ampe.iso

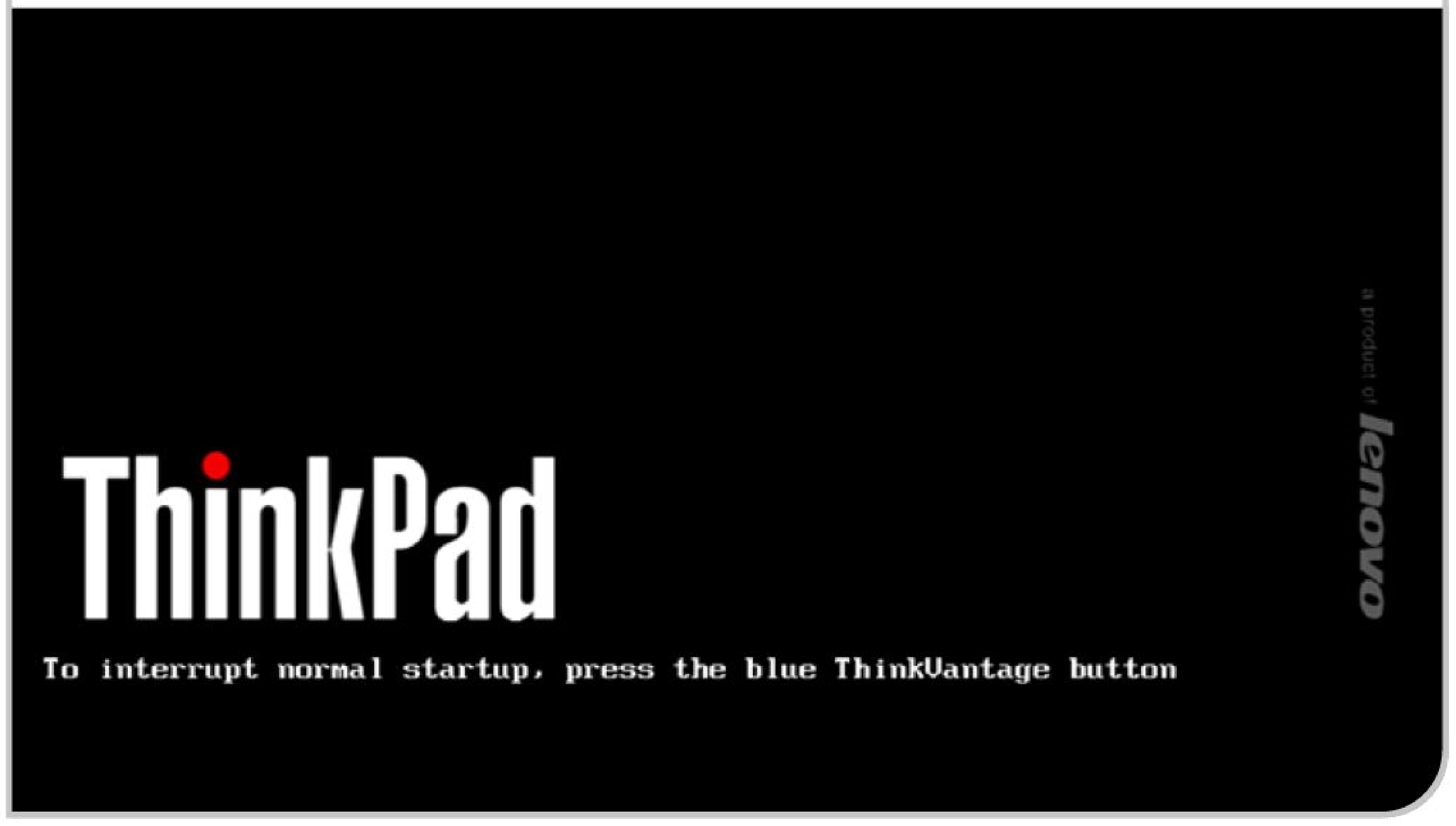
Installing Linux on a PC

With your installation media ready it is time to install Linux on your computer. Installing Linux should be a pain free process and it only takes around half an hour. It’s best to dedicate a whole drive to Linux, rather than try to dual boot Windows and Linux from one drive. The initial process shown below is the same if installing on a brand new PC with no OS, you can just ignore the part about replacing Windows.

Installation process

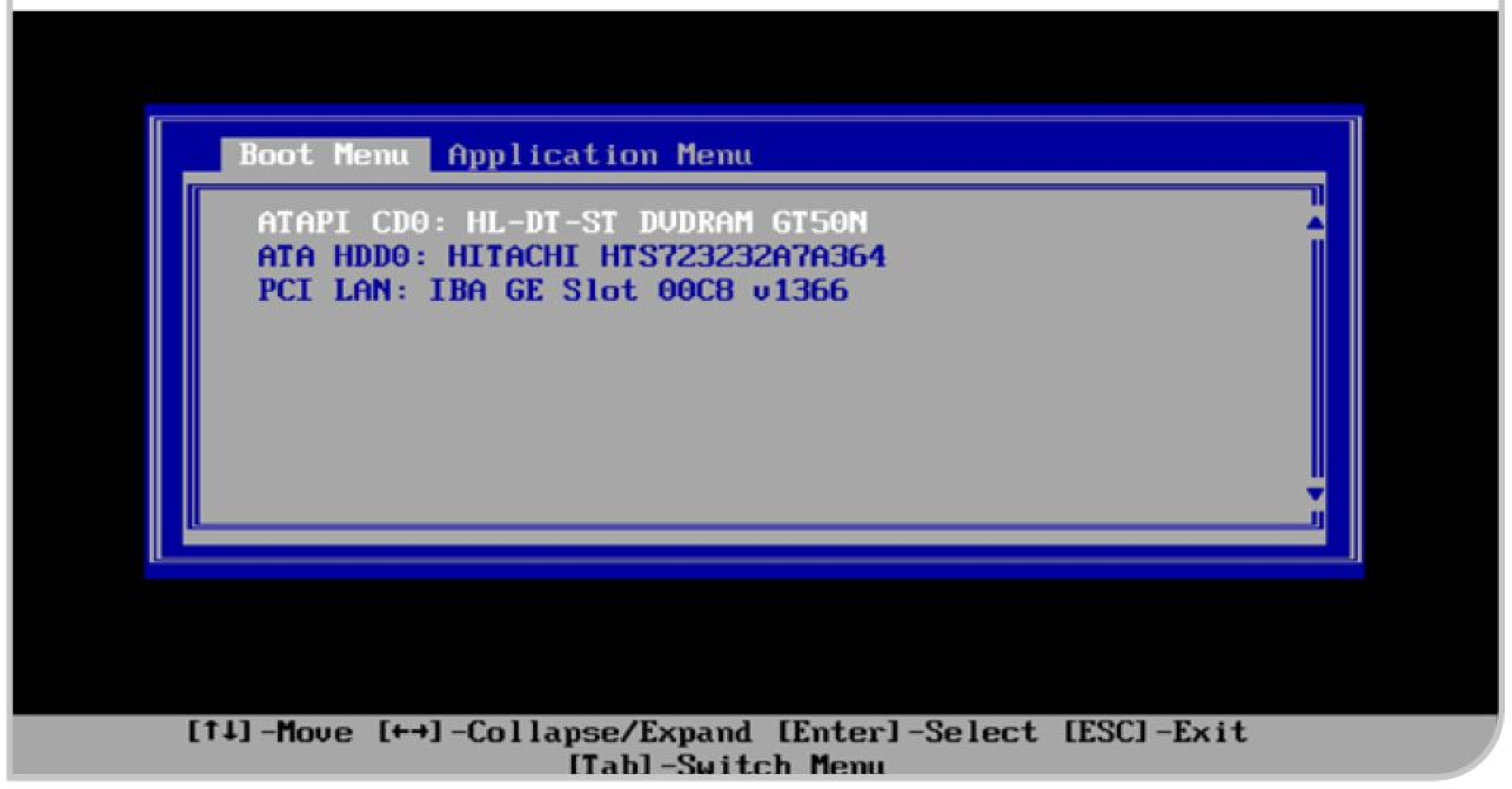
The installation process for all versions of Linux is largely the same. Ensure that your installation media (DVD or USB Flash Drive) is inserted and tell your computer to boot into it. We are going to install Ubuntu.

STEP 1 Insert your DVD or attach the USB Flash Drive to your PC and shut down Windows. The process is the same for both types of installation media but we are using the USB Flash drive that we created. Start up your PC and hold down the button you use to interrupt Startup and access the BIOS.



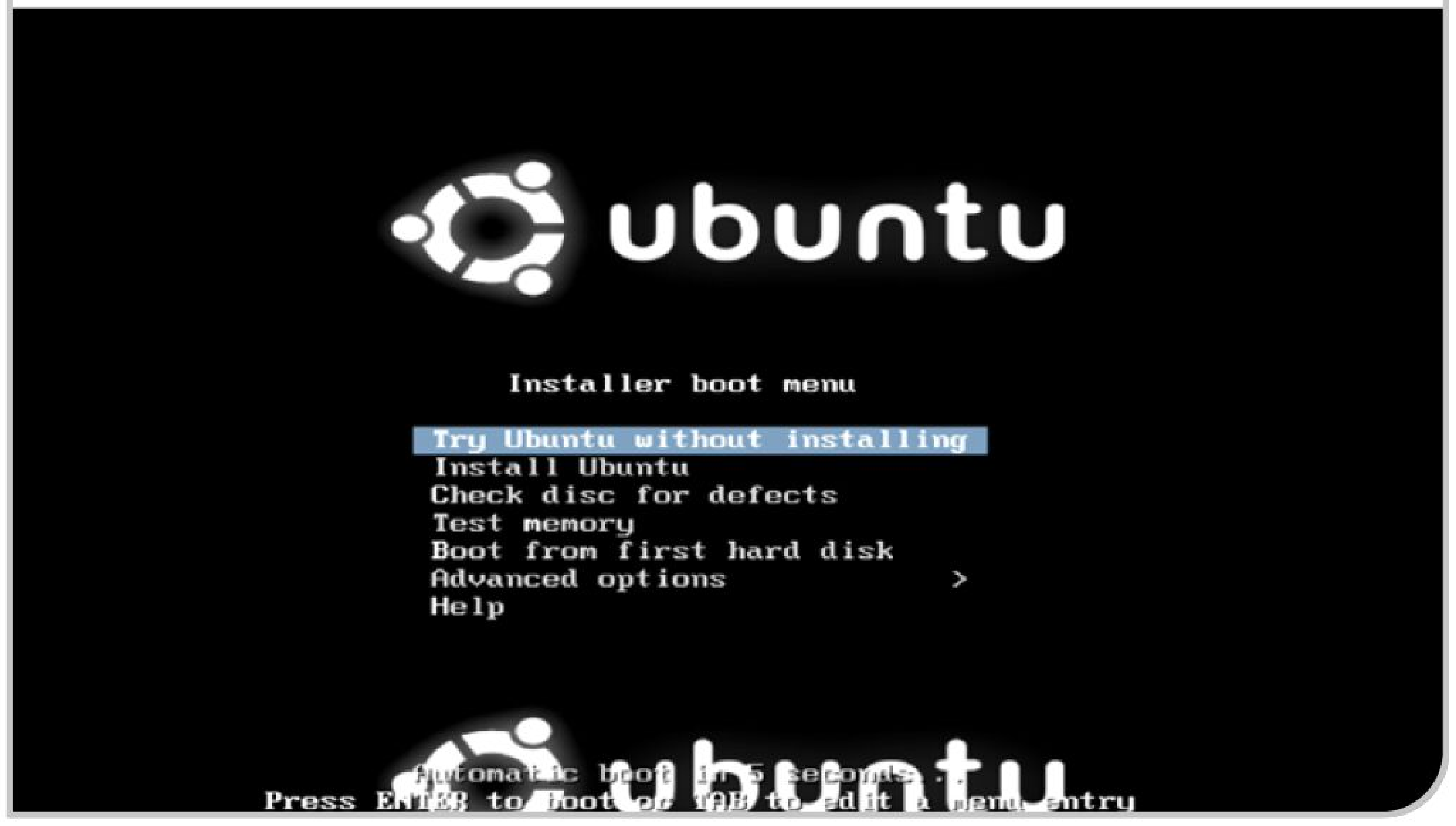
```
To interrupt normal startup, press the blue ThinkVantage button
```

STEP 2 If your PC has an option to choose a Temporary Startup device, like our Lenovo ThinkPad, then press the key to pick it. Choose the DVD Drive, ours is ATAPI CD0, and press Enter. If you do not have a Temporary Startup device you will need to head into your BIOS and set your PC to boot from the DVD before your hard drive.



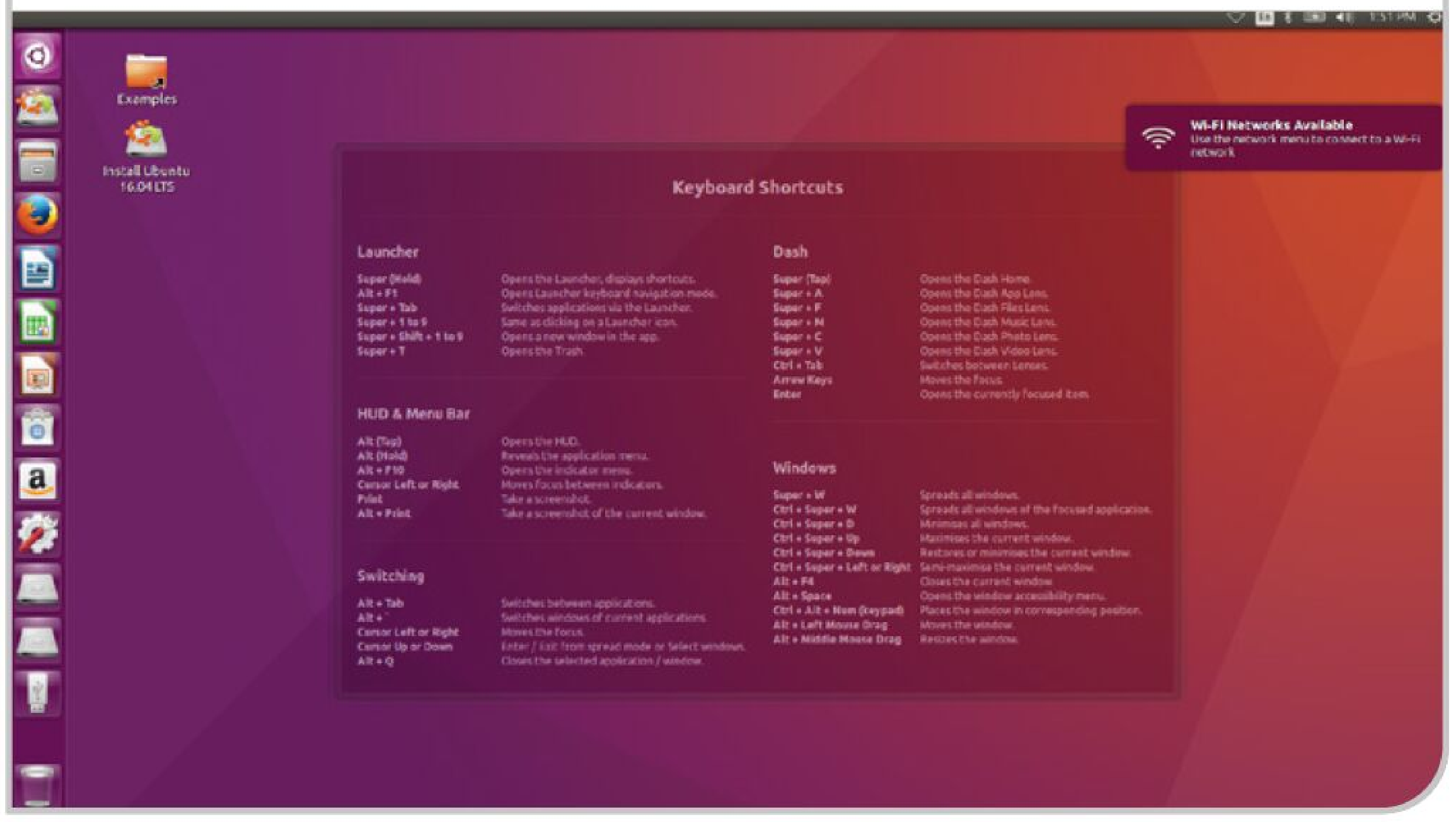
```
Boot Menu  Application Menu

ATAPI CD0: HL-DT-ST DVDRAM GT50N
ATA HDD0: HITACHI HTS723232A7A364
PCI LAN: IBA GE Slot 00C8 v1366

[↑↓]-Move [←→]-Collapse/Expand [Enter]-Select [ESC]-Exit
                  [Tab]-Switch Menu
```

STEP 3 Your PC will now start up. Instead of running Windows you will see a menu with Try Ubuntu and Install Ubuntu options. If you are installing from DVD they will be large icons, if you install from USB Flash drive it will be a text menu. Either way pick Try Ubuntu.

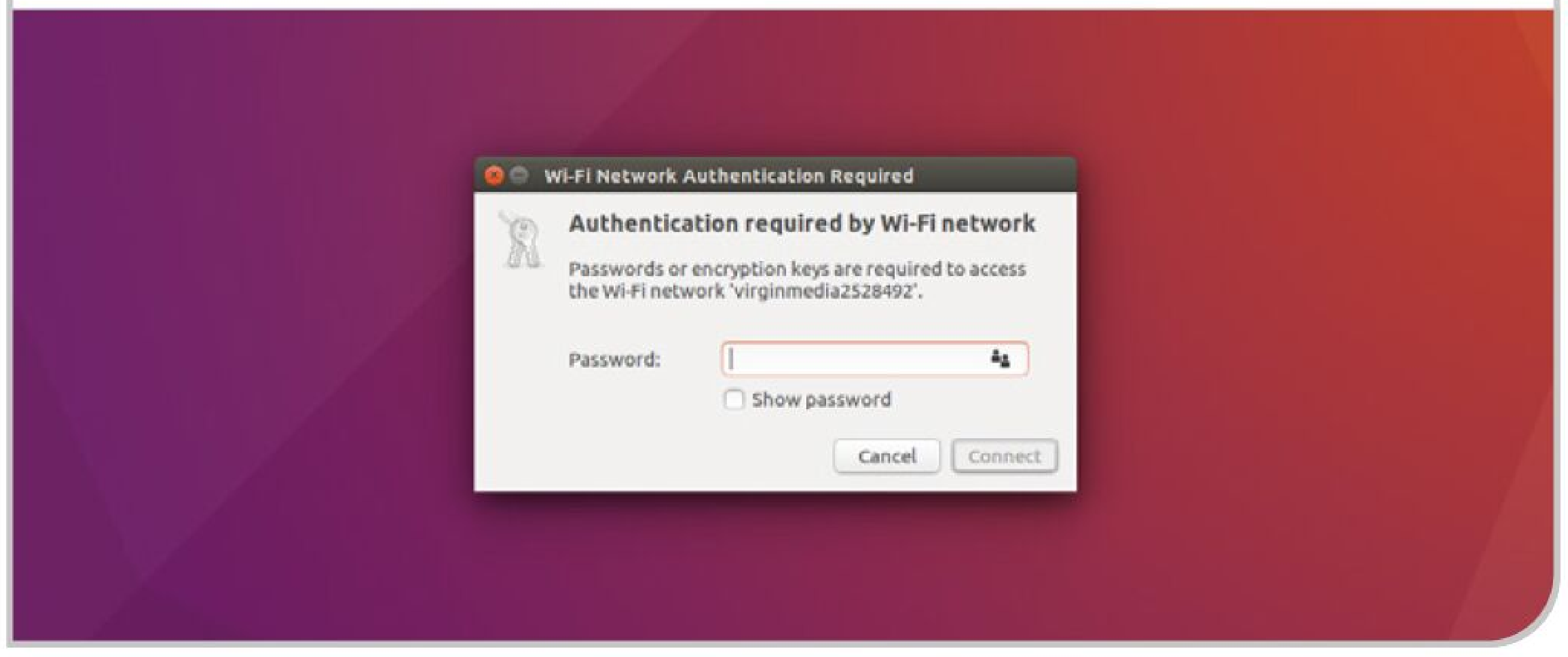


```
Installer boot menu

Try Ubuntu without installing
Install Ubuntu
Check disc for defects
Test memory
Boot from first hard disk
Advanced options            >
Help

Automatic boot in 5 seconds...
Press ENTER to boot or TAB to edit a menu entry
```

STEP 4 Your windows PC will now boot into Ubuntu and display some keyboard shortcuts. Click the “X” icon to get rid of them for now. You are now running in Try Ubuntu mode and can experiment with the operating system. It is not installed fully and won’t save any files.



STEP 5 Before you start the installation it's a good idea to connect to your local network. Connect an ethernet cable or click the Wi-Fi icon in the top right and choose your network. Enter your Wi-Fi password and click Connect. A notification should display Connected in the top right of the desktop.



Wi-Fi Network Authentication Required

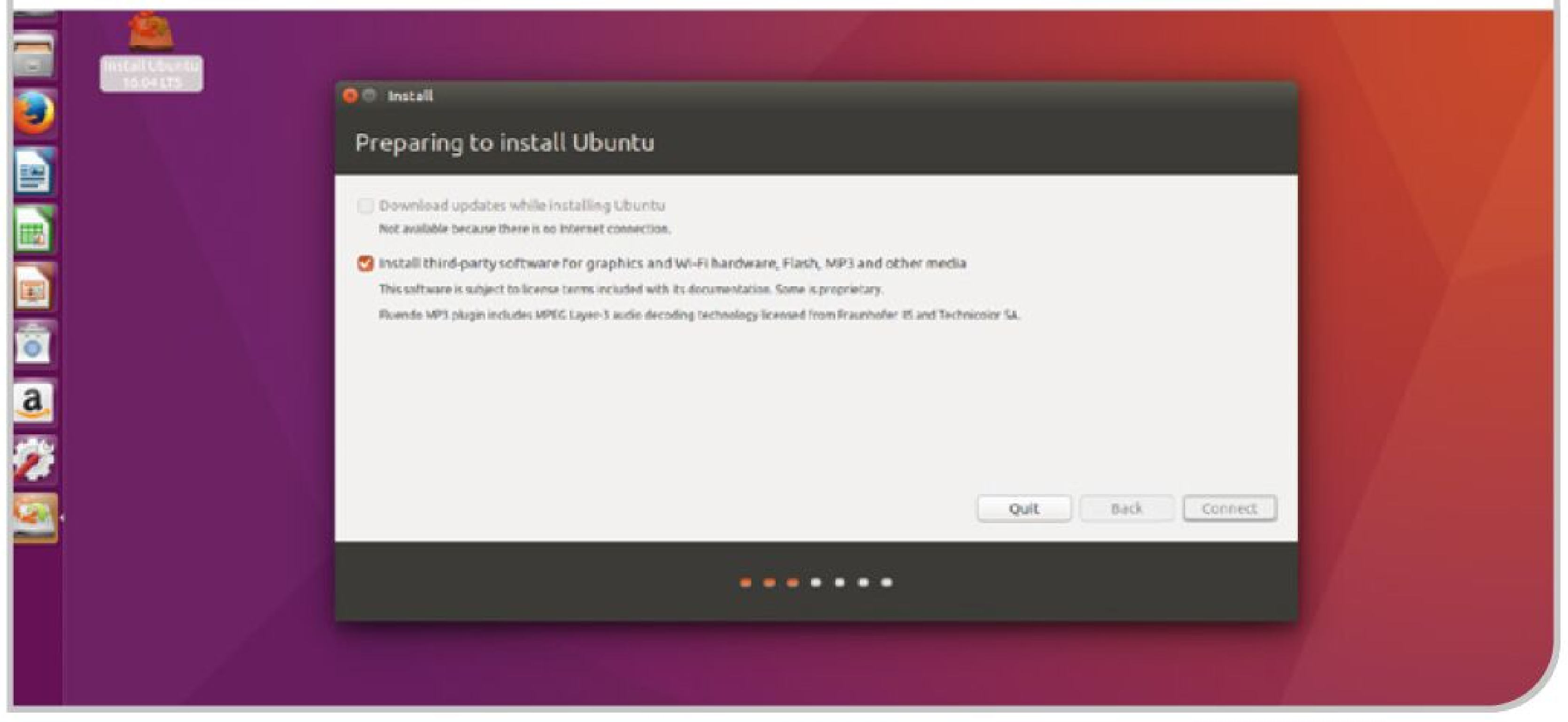
Authentication required by Wi-Fi network

Passwords or encryption keys are required to access the Wi-Fi network 'virginmedia2528492'.

Password:

☐ Show password

STEP 6 Double-click the install Ubuntu 14.04.4 LTS icon on the desktop to start the full installation process. Ensure that English is selected in the Welcome screen and click Continue. Select "Download updates while installing" and "Install this third-party software" and click Continue.



Install

Preparing to install Ubuntu

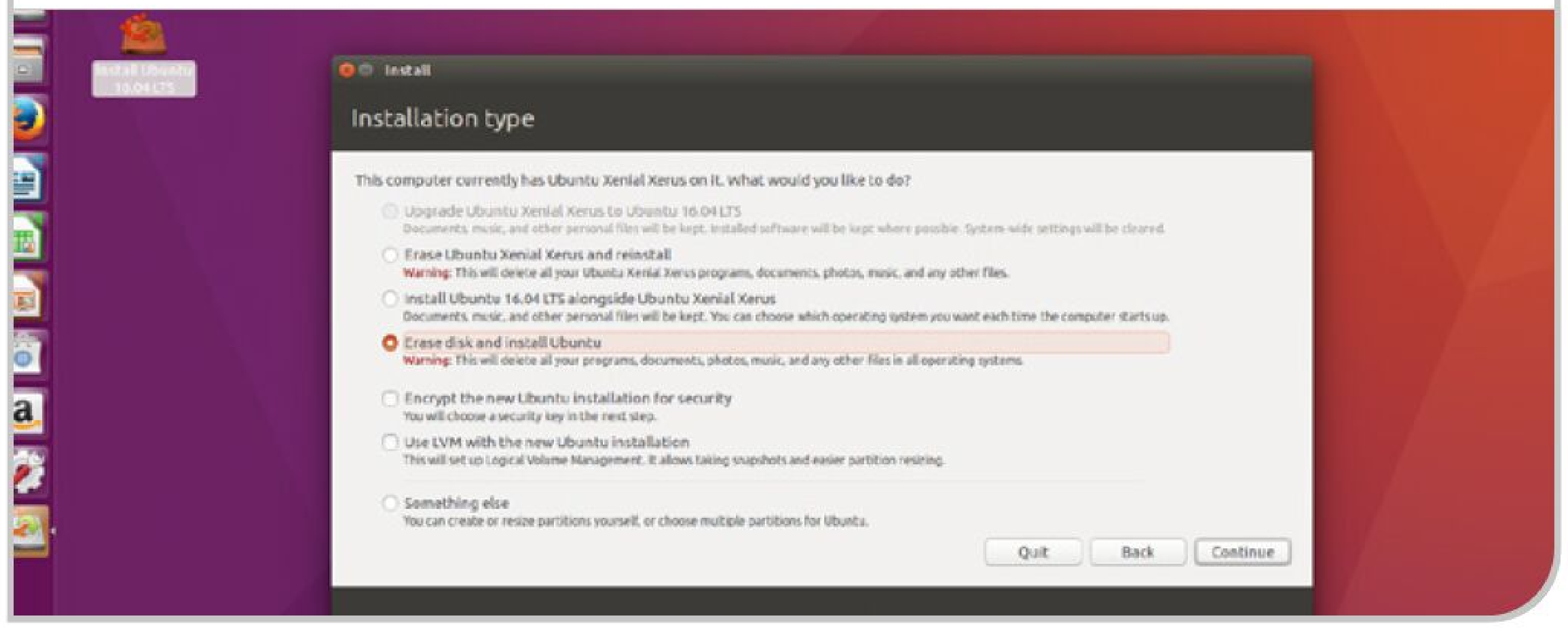
☐ Download updates while installing Ubuntu
Not available because there is no internet connection.

☑ Install third-party software for graphics and Wi-Fi hardware, Flash, MP3 and other media
This software is subject to license terms included with its documentation. Some is proprietary.
Fluendo MP3 plugin includes MPEG Layer-3 audio decoding technology licensed from Fraunhofer IIS and Technicolor SA.

Replacing Windows

You are now ready to get rid of Windows and install Linux. Following these steps erases Windows from your hard drive, so be sure to save any files on the Windows system that you want.

STEP 1 The Installation Type window will display "install Ubuntu alongside Windows 10". It is tempting but do not pick this option. There are numerous problems when trying to run both operating systems together. Follow our Virtualization Tutorial if you want both at the same time. Instead pick "Erase disk and install Ubuntu".



Install

Installation type

This computer currently has Ubuntu Xenial Xerus on it. What would you like to do?

○ Upgrade Ubuntu Xenial Xerus to Ubuntu 16.04 LTS
Documents, music, and other personal files will be kept. Installed software will be kept where possible. System-wide settings will be cleared.

○ Erase Ubuntu Xenial Xerus and reinstall
Warning: This will delete all your Ubuntu Xenial Xerus programs, documents, photos, music, and any other files.

○ Install Ubuntu 16.04 LTS alongside Ubuntu Xenial Xerus
Documents, music, and other personal files will be kept. You can choose which operating system you want each time the computer starts up.

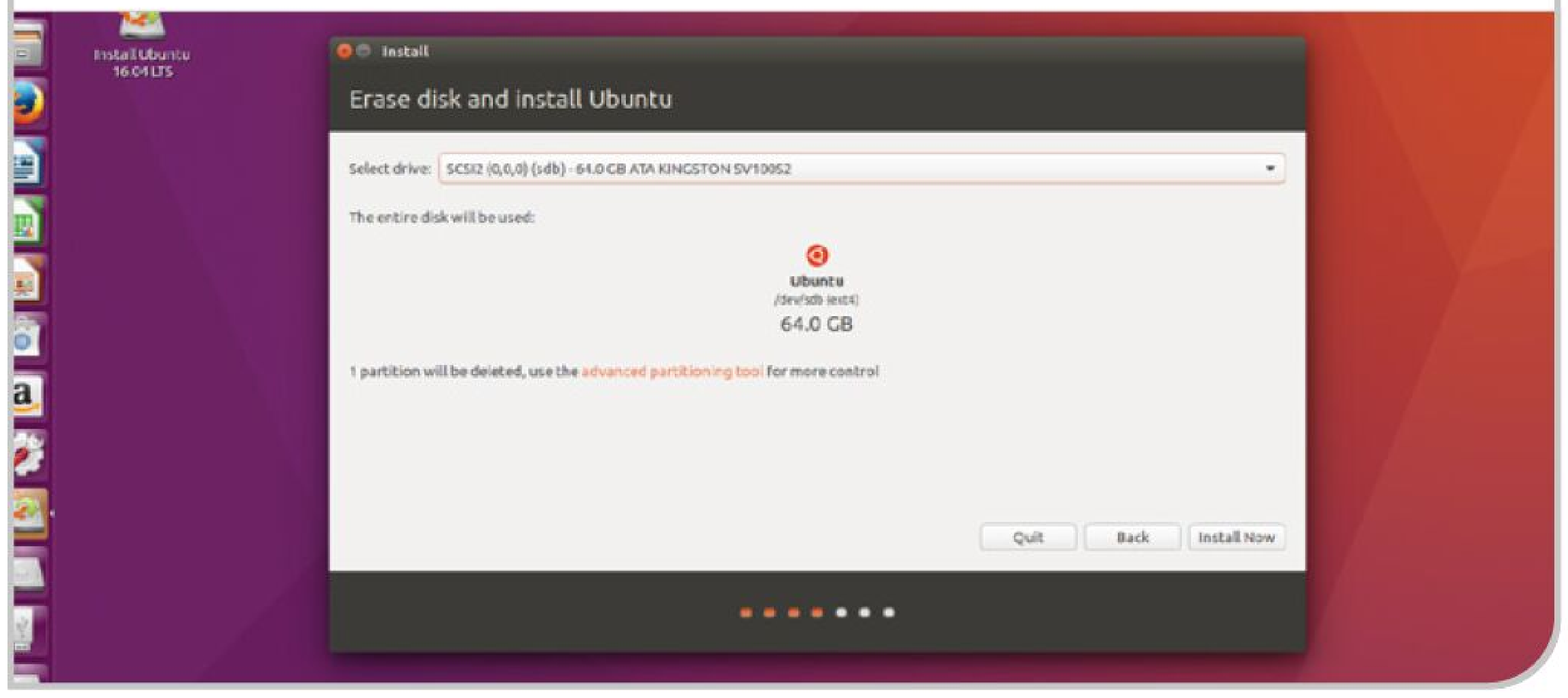
● Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

☐ Encrypt the new Ubuntu installation for security
You will choose a security key in the next step.

☐ Use LVM with the new Ubuntu installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.

○ Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

STEP 2 Click Install Now and this warning screen will appear. It is telling you that it will destroy all data on your main hard drive and format new partitions. You don't want Windows anyway so click Continue. The next window asks you to confirm your location; pick the correct city and click Continue.



Install

Erase disk and install Ubuntu

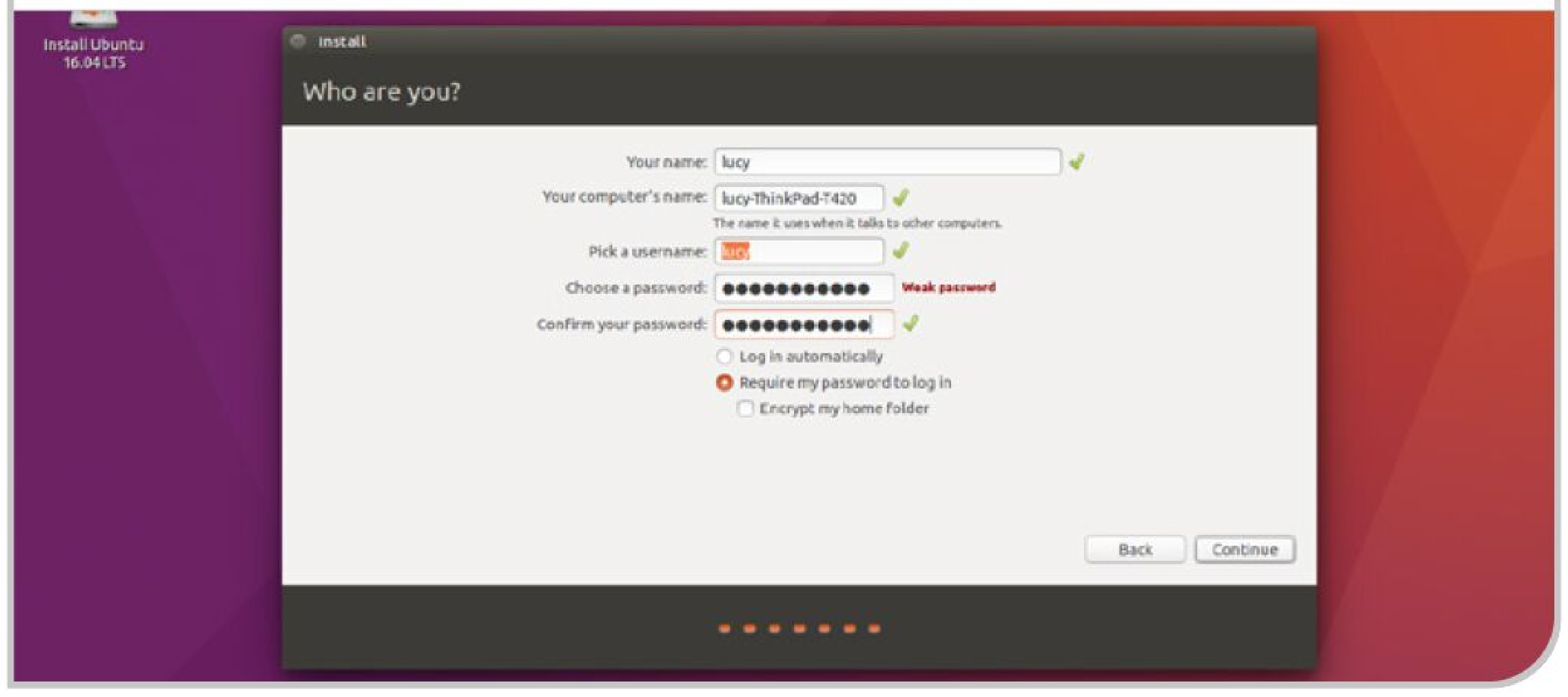
Select drive: SCSI2 (0,0,0) (sdb) - 64.0 GB ATA KINGSTON SV10052

The entire disk will be used:

Ubuntu
/dev/sdb (ext4)
64.0 GB

1 partition will be deleted, use the advanced partitioning tool for more control

STEP 3 Linux will take a guess at your keyboard layout based on your location. Make sure it is correct and click Continue. In the "Who are you?" window enter your name and fill out the Choose a password and Confirm your password fields. Click Continue to start the installation process.

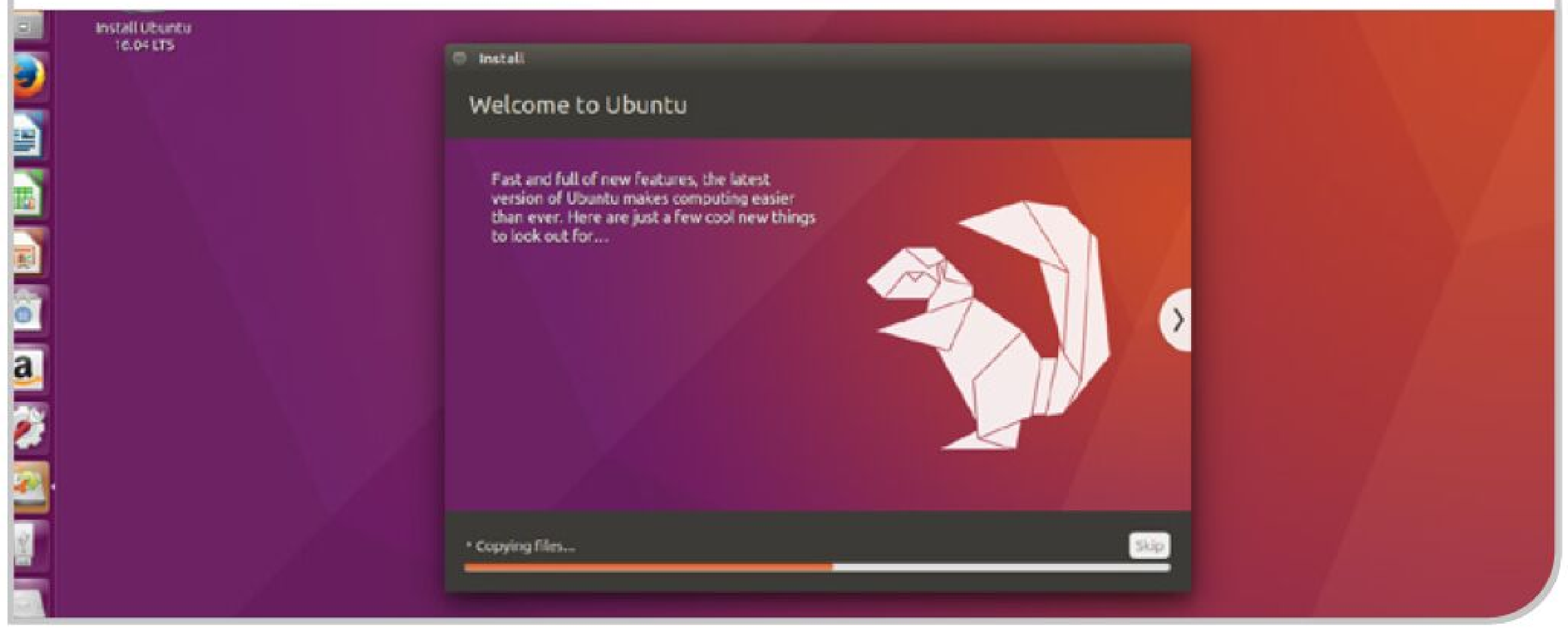


Install

Who are you?

Your name: lucy ✓
Your computer's name: lucy-ThinkPad-T420 ✓
The name it uses when it talks to other computers.
Pick a username: lucy ✓
Choose a password: ●●●●●●●●●●●● Weak password
Confirm your password: ●●●●●●●●●●●● ✓
○ Log in automatically
● Require my password to log in
☐ Encrypt my home folder

STEP 4 The installation process now begins and Ubuntu displays a Welcome to Ubuntu 14.04 screen. A status bar along the bottom fills up as the various installation procedures take place. The installation takes around half an hour, depending on the speed of your system. Click Restart Now when it has finished to start using your new Linux computer.



Install

Welcome to Ubuntu

Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for...

▸ Copying files...

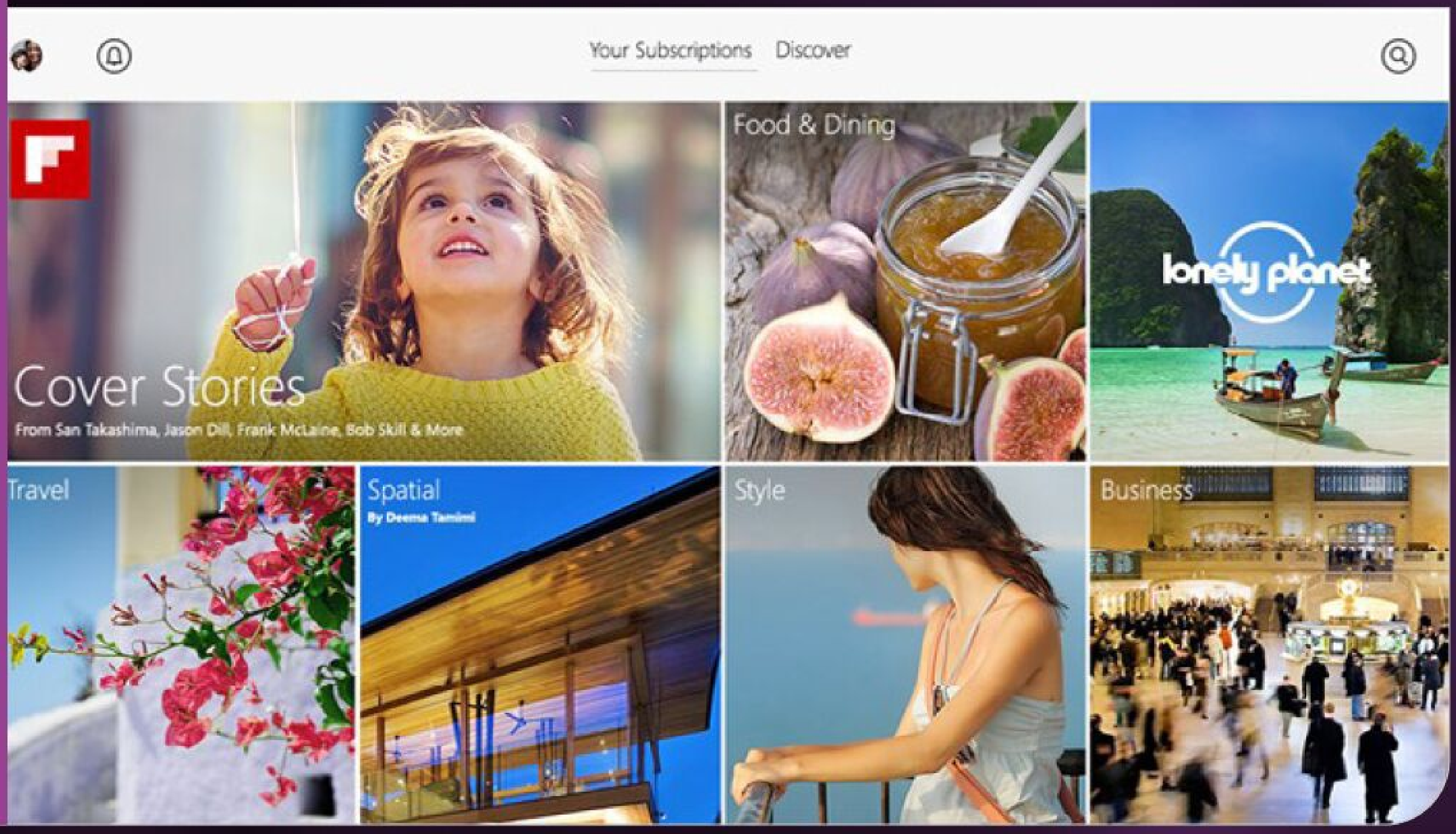
20 Essential Apps

The Windows Store is crammed full of useful apps for your computer, from well-known names like Spotify to little known but extremely useful apps like Pin More. Over the next few pages we will take a look at some of the best, most useful and most unique apps available to download right now.

FLIPBOARD

Price: Free

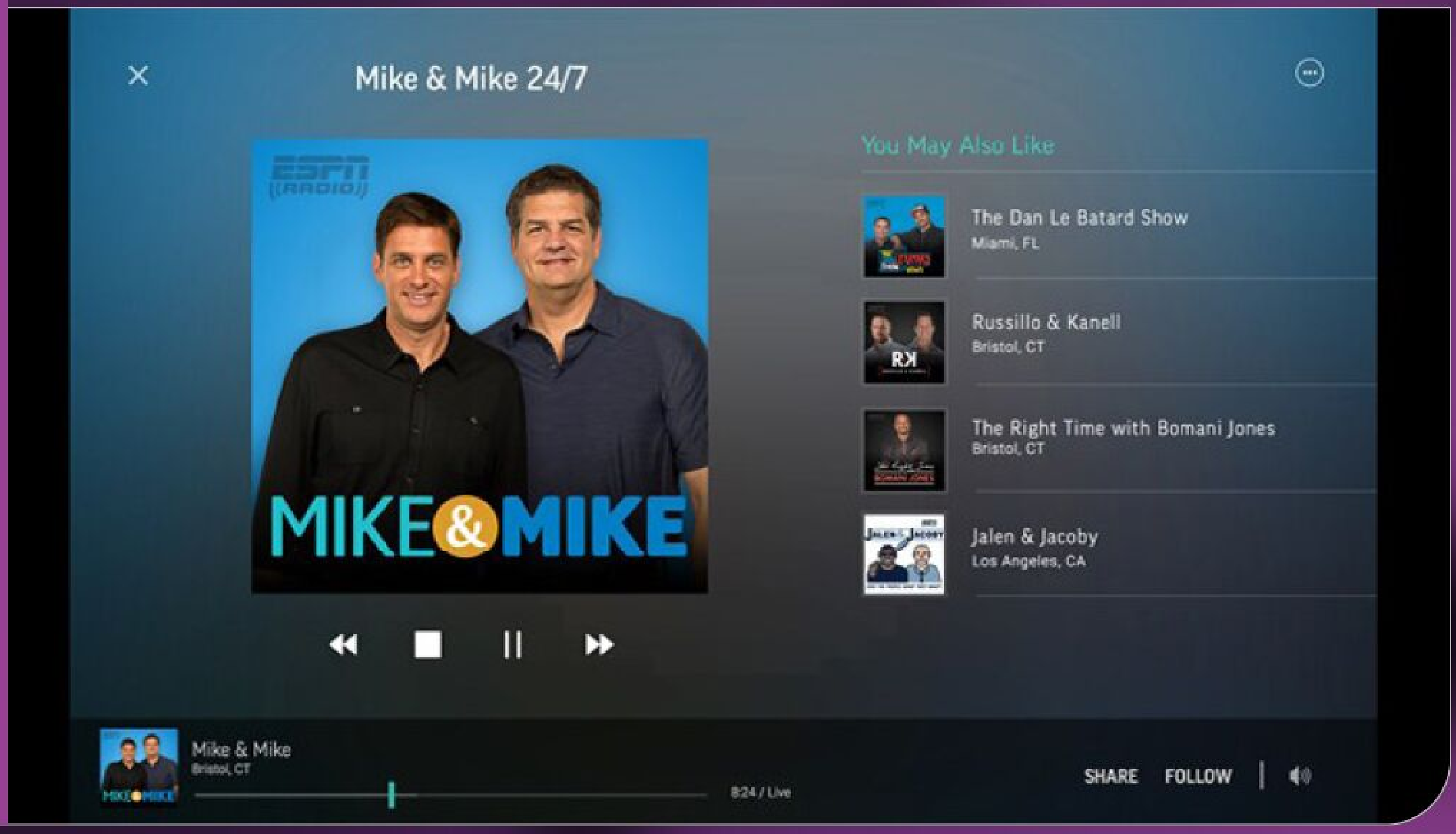
Flipboard is one of those apps you will wonder how you lived without. You can browse through categorised news items and in that way it's similar to Windows 10's own News app. That is where the similarity ends, as will be able to create curated 'magazines' that you can come back to. It also works on multiple devices, so you can have the same information on phone and desktop.


Your Subscriptions
Discover
Cover Stories
From San Takashima, Jason Dill, Frank McLaine, Bob Skill & More
Food & Dining
lonely planet
Travel
Spatial
By Deena Tamimi
Style
Business

TUNEIN RADIO

Price: Free

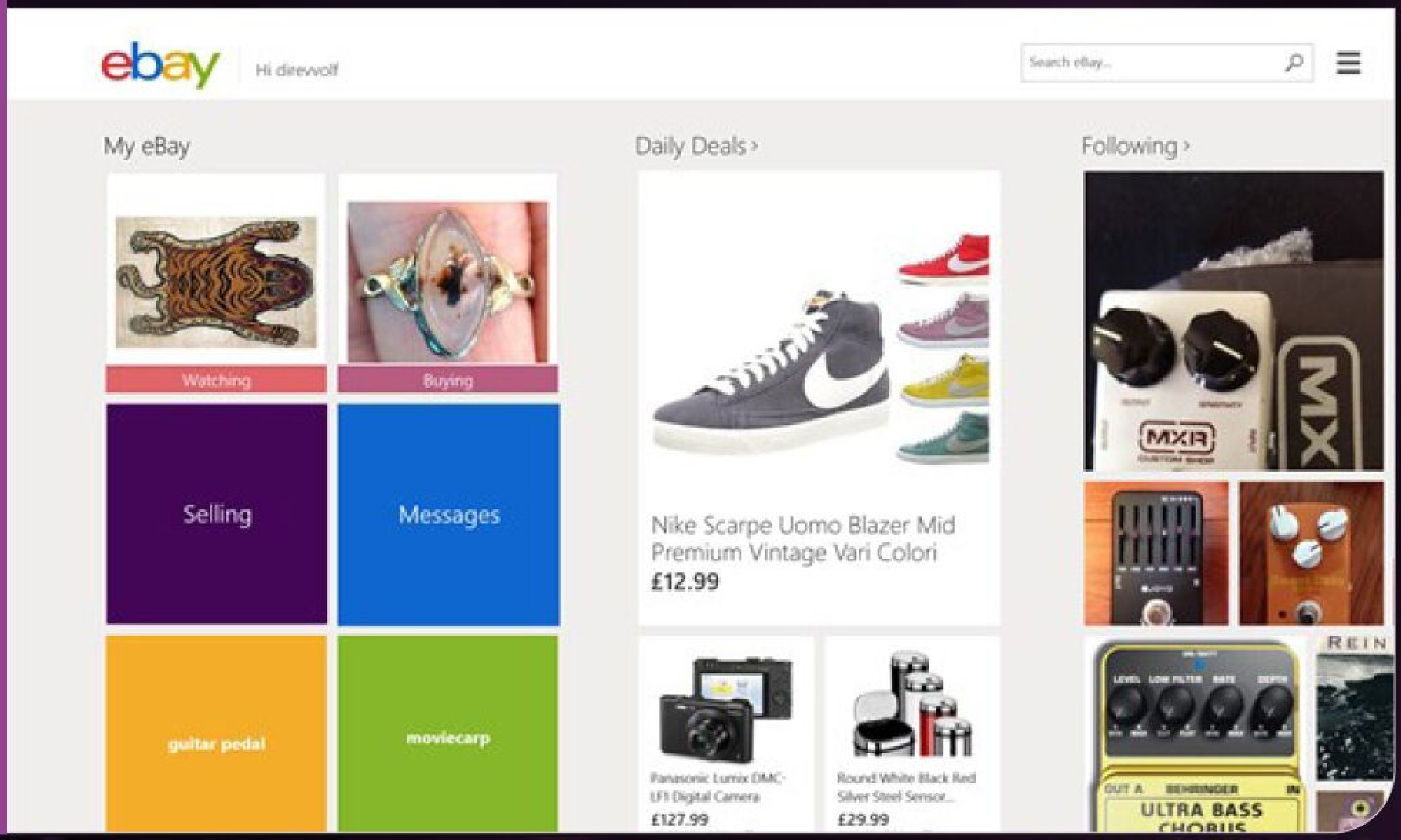
If you are a lover of digital radio, what better way to listen to your favourite stations than through your PC? Not only does TuneIn Radio give you access to all of the major DAB radio stations, you can also search out lesser-known internet ones as well. Hundreds of radio stations are divided up by region and many more categorised into dozens of genres.


Mike & Mike 24/7
You May Also Like
The Dan Le Batard Show
Miami, FL
Russillo & Kanell
Bristol, CT
The Right Time with Bomani Jones
Bristol, CT
Jalen & Jacoby
Los Angeles, CA
MIKE&MIKE
Mike & Mike
Bristol, CT
SHARE
FOLLOW

EBAY

Price: Free

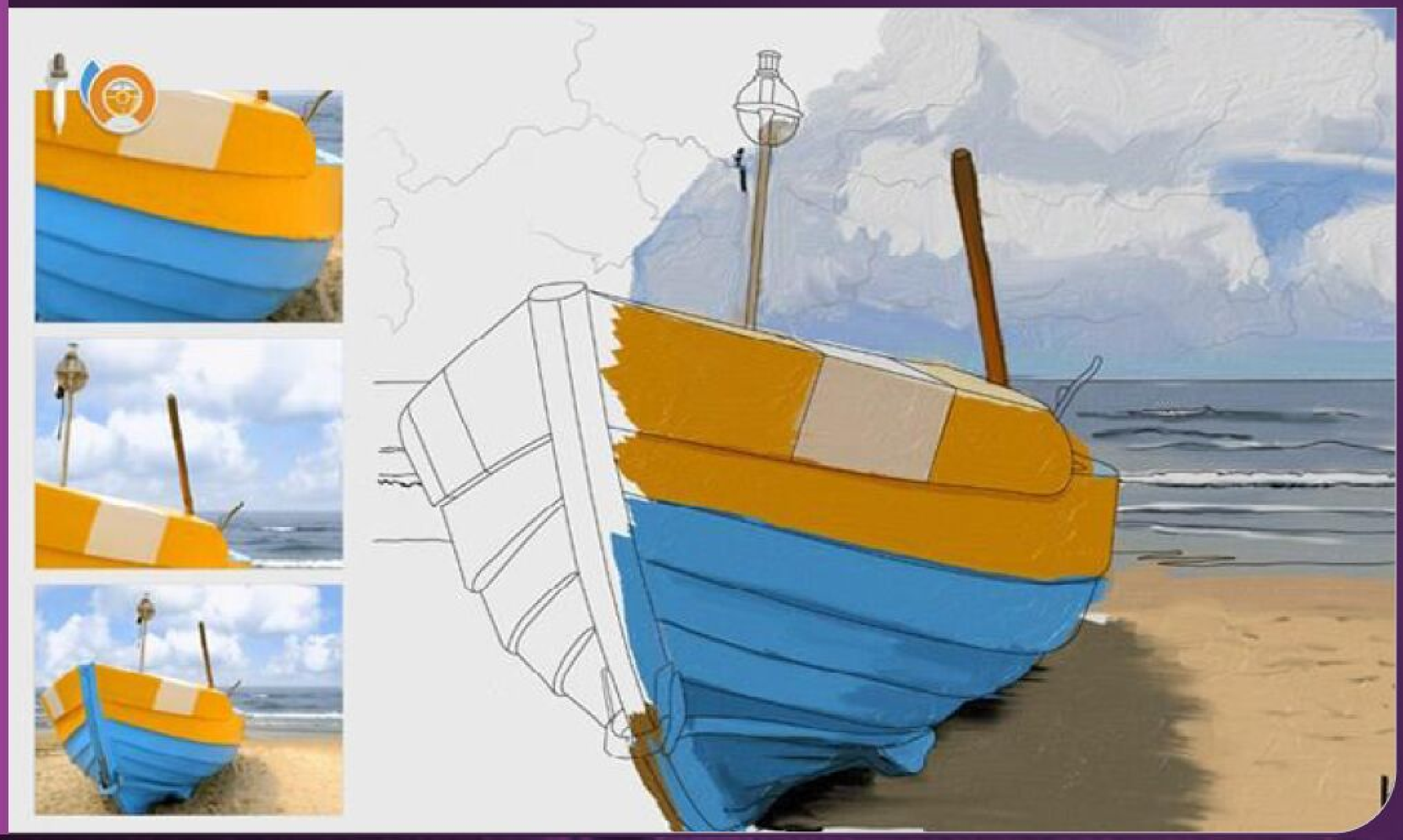
What we love most about eBay for Windows is its ability to send us notifications about what we are selling, plus auctions we are tracking that will end soon. It is a relatively simple version of the auction site, so don't expect the ability to alter your PayPal account details, but you can do all the essential stuff including viewing and replying to messages.


ebay
Hi direwolf
Search eBay...
My eBay
Watching
Buying
Selling
Messages
guitar pedal
moviecarp
Daily Deals ›
Nike Scarpe Uomo Blazer Mid Premium Vintage Vari Colori
£12.99
Panasonic Lumix DMC-LF1 Digital Camera
£127.99
Round White Black Red Silver Steel Sensor...
£29.99
Following ›

FRESH PAINT

Price: Free

Unleash your inner creativity with Fresh Paint, the ultimate canvas for your big ideas. Fresh Paint is a fun and easy way to paint, with the right tools for artists of all ages. Create original artwork, turn photos into beautiful paintings or choose an activity pack to help you get started quickly. From whimsical pictures of your friends to amazing landscapes, Fresh Paint enables you to create anything.



NEWS REPUBLIC

Price: Free

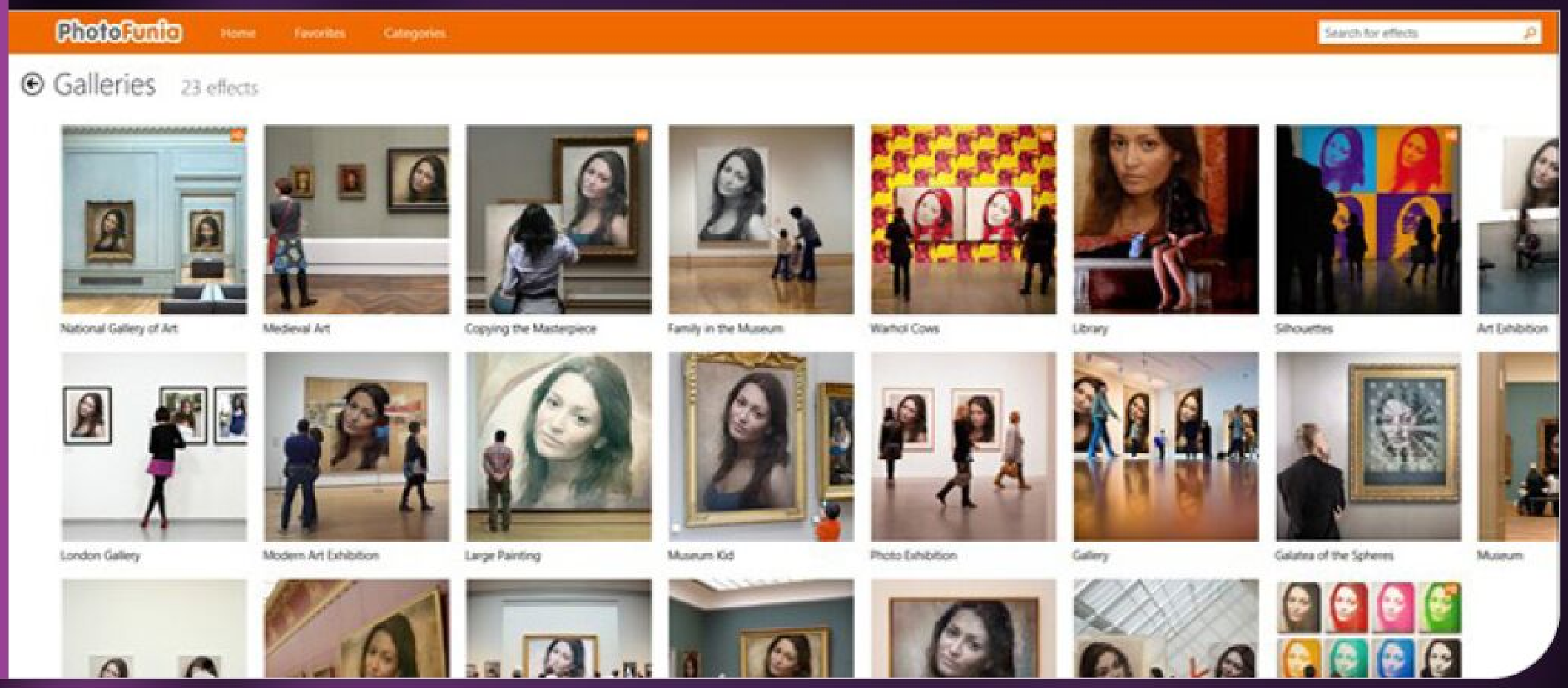
News Republic is the premiere news application for the smart and savvy reader and one of our favourites. This is mainly because the app recognises that content is king. News Republic truly gives users an international and personalised news experience, while pulling together the best elements of a visual news reader and a news aggregator into one streamlined and easy-to-use app.

News Republic
Favorites
News Republic
Be your own news editor!
Create your very own News Channels on your favorite topics...
Entertainment
AN AMERICA BUILT TO LAST
Politics
458
363
532

PHOTOFUNIA

Price: Free

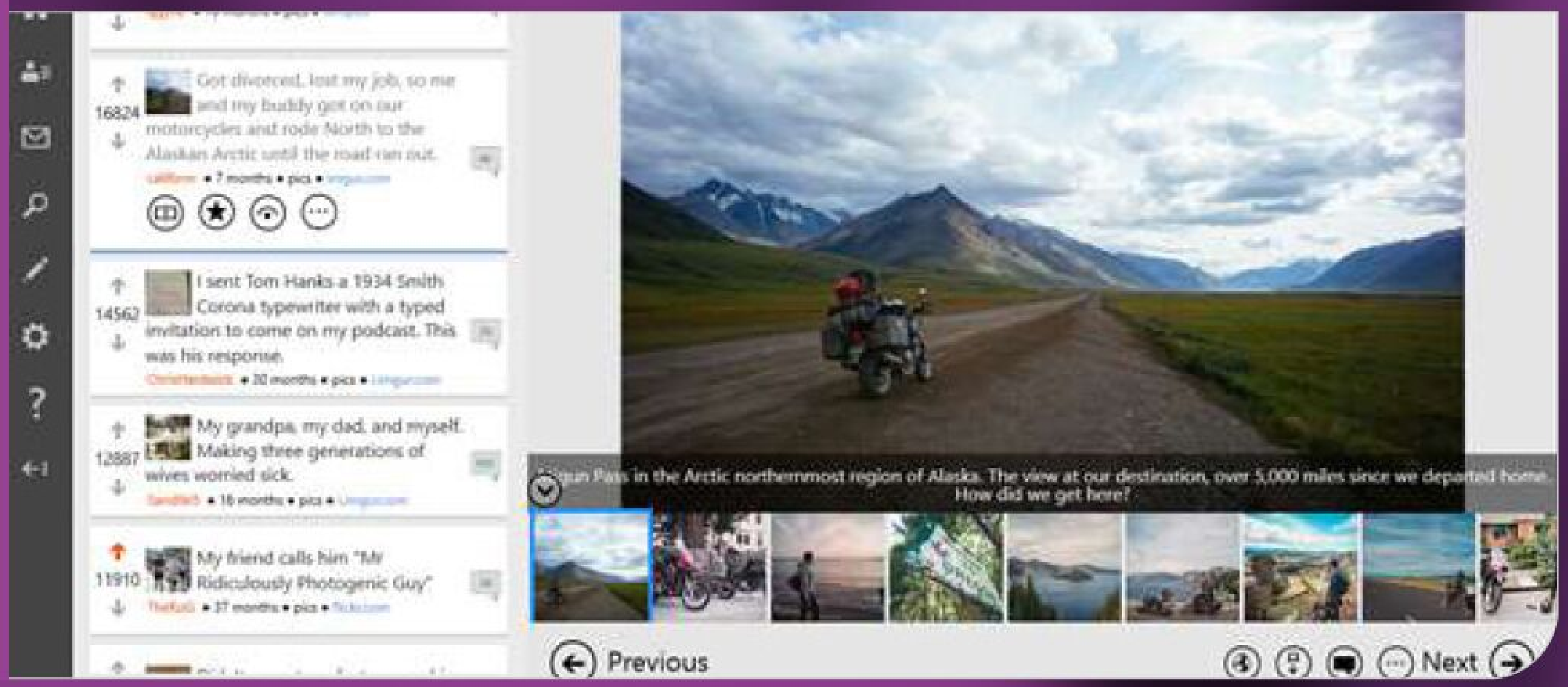
PhotoFunia is an innovative online picture editing tool that lets you produce animated and fun images instantly with ease, using your own photos, a bit of imagination and silliness! PhotoFunia is free and very easy to use. Just select an effect you like from over 300 different ones, select your photo and PhotoFunia will handle the rest for you.


PhotoFunia
Galleries
23 effects

REDDITTING

Price: Free

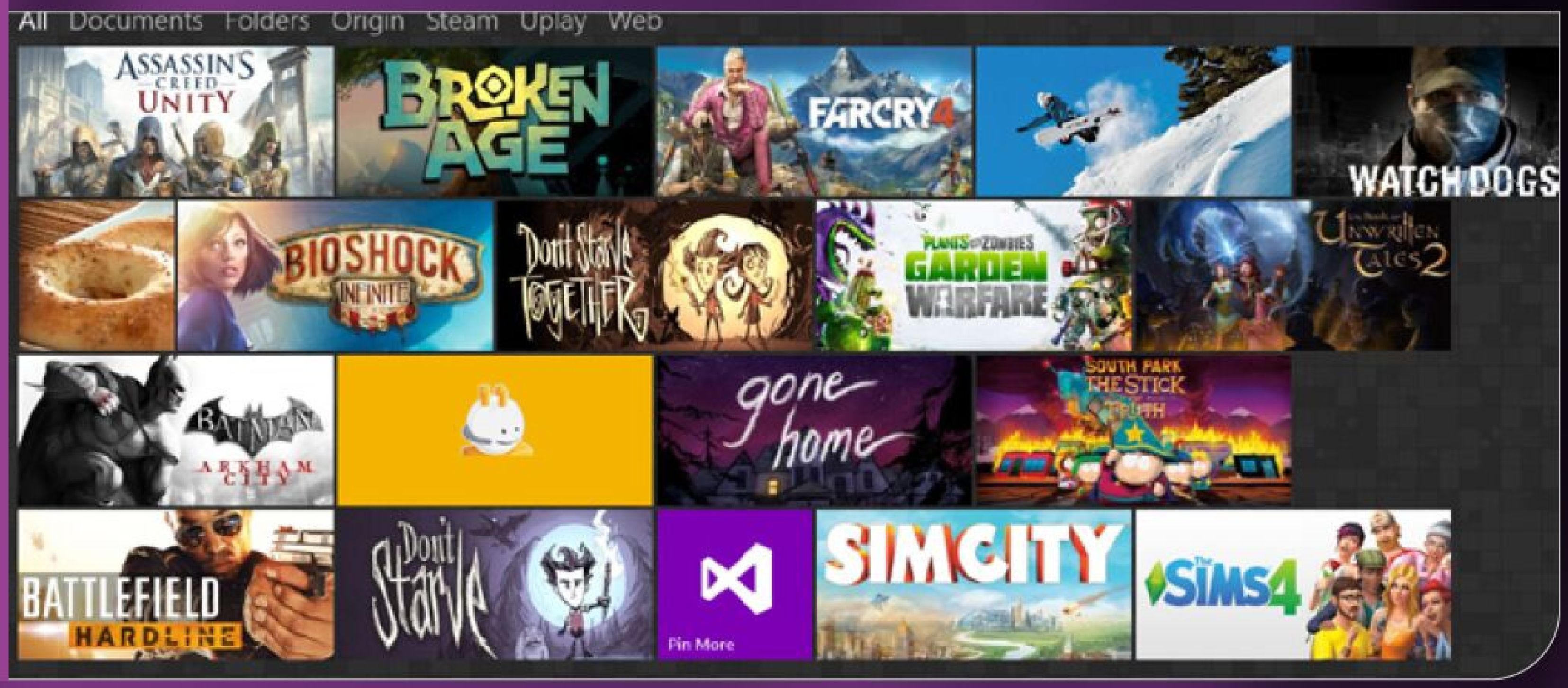
Navigating the huge amount of news, memes and random discussion threads that make up Reddit is no mean feat but the Redditting client does a brilliant job of boiling it down. Essentially, it turns Reddit into an RSS reader. This app allows you to browse Reddit with or without an account. With an account you can interact with Reddit in a very similar way to being on the Reddit site itself.


Previous
Next

PIN MORE

Price: £2.29 $2.99 € 2,99

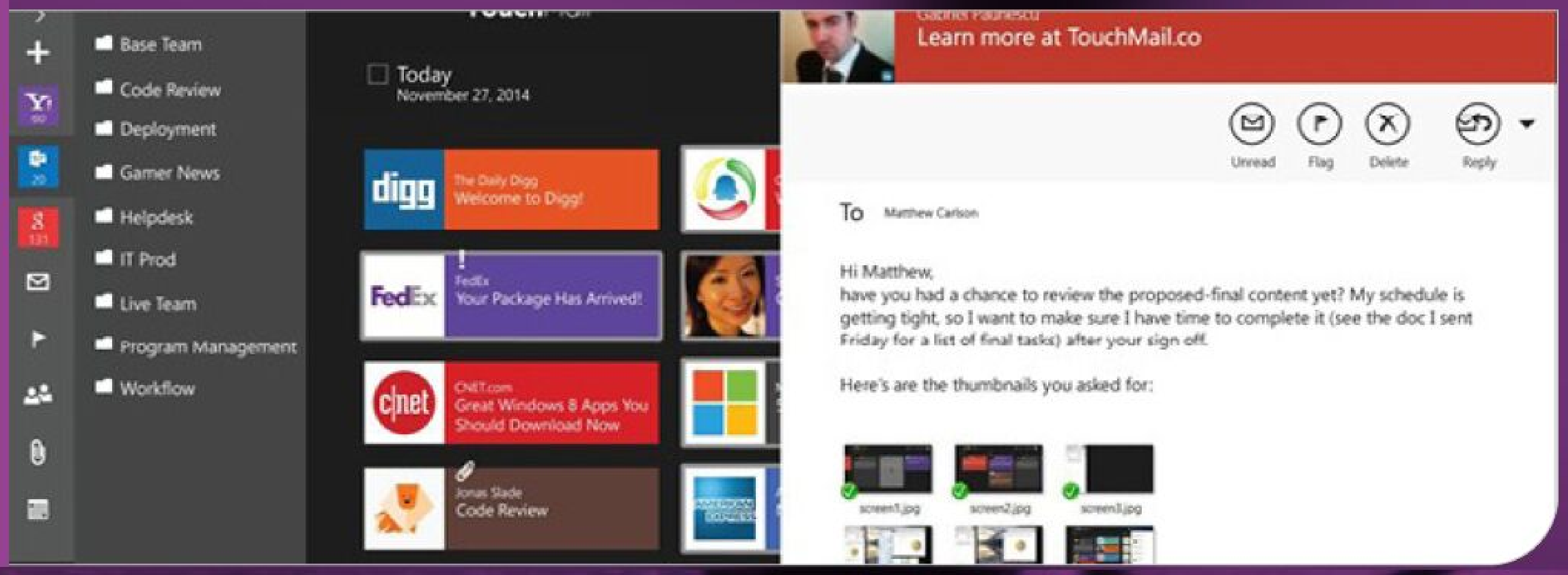
Pin custom tiles for Steam, Origin, Battle.net and Uplay games; documents, document folders and websites to your Start screen. Create static tiles with any image you want as a logo or use up to 5 images to create a live tile that cycles between them all. You can also create live tiles for your Steam games that display achievements or for your favourite websites displaying their latest news.


All
Documents
Folders
Origin
Steam
Uplay
Web
ASSASSIN'S CREED UNITY
BROKEN AGE
FARCRY4
WATCH DOGS
BIOSHOCK INFINITE
Don't Starve Together
PLANTS vs ZOMBIES GARDEN WARFARE
Unwritten Tales 2
gone home
SOUTH PARK THE STICK OF TRUTH
BATMAN ARKHAM CITY
BATTLEFIELD HARDLINE
Don't Starve
Pin More
SIMCITY
The Sims 4

TOUCHMAIL

Price: Free

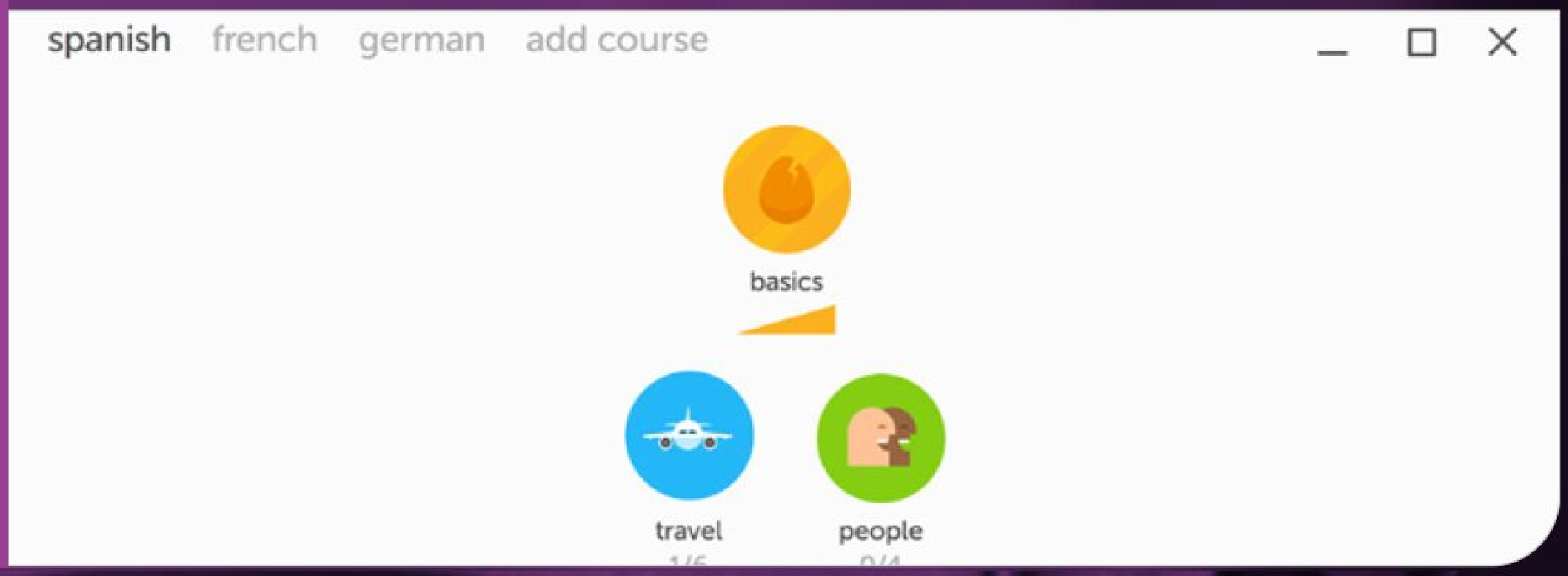
Turn your Gmail, Hotmail, Yahoo and others into colourful, visual tiles that you can explore with your fingers or mouse. Rich 3D visualizations and familiar gestures make TouchMail the fastest and easiest way to keep your inbox clean and browse your email in a meeting, on the couch or on the go. TouchMail supports Gmail, Outlook.com, Yahoo Mail, AOL, iCloud and Office 365.


Base Team
Code Review
Deployment
Gamer News
Helpdesk
IT Prod
Live Team
Program Management
Workflow
Today
November 27, 2014
digg
Welcome to Digg!
FedEx
Your Package Has Arrived!
cnet
Great Windows 8 Apps You Should Download Now
Code Review
Learn more at TouchMail.co
Unread
Flag
Delete
Reply

DUOLINGO

Price: Free

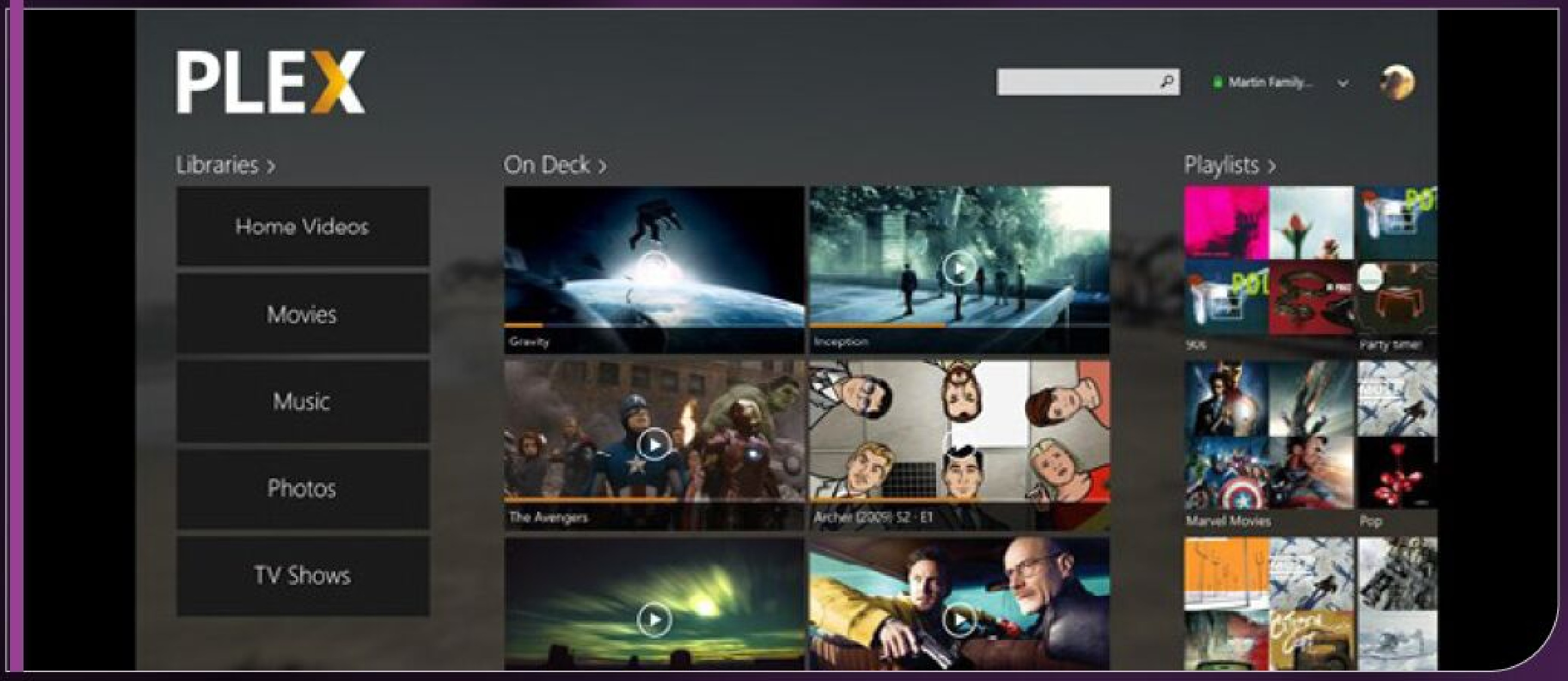
With Duolingo, you are able to learn Spanish, French, German, Portuguese, Italian or English in possibly the most effective way we've ever seen in a language learning app. On the home page you are presented with a 'Skill Tree' with a variety of different skills. Starting from the top Skills, Basic 1 and Basic 2, you must successfully complete each level in order to unlock the following one.


spanish
french
german
add course
basics
travel
people

PLEX

Price: Free

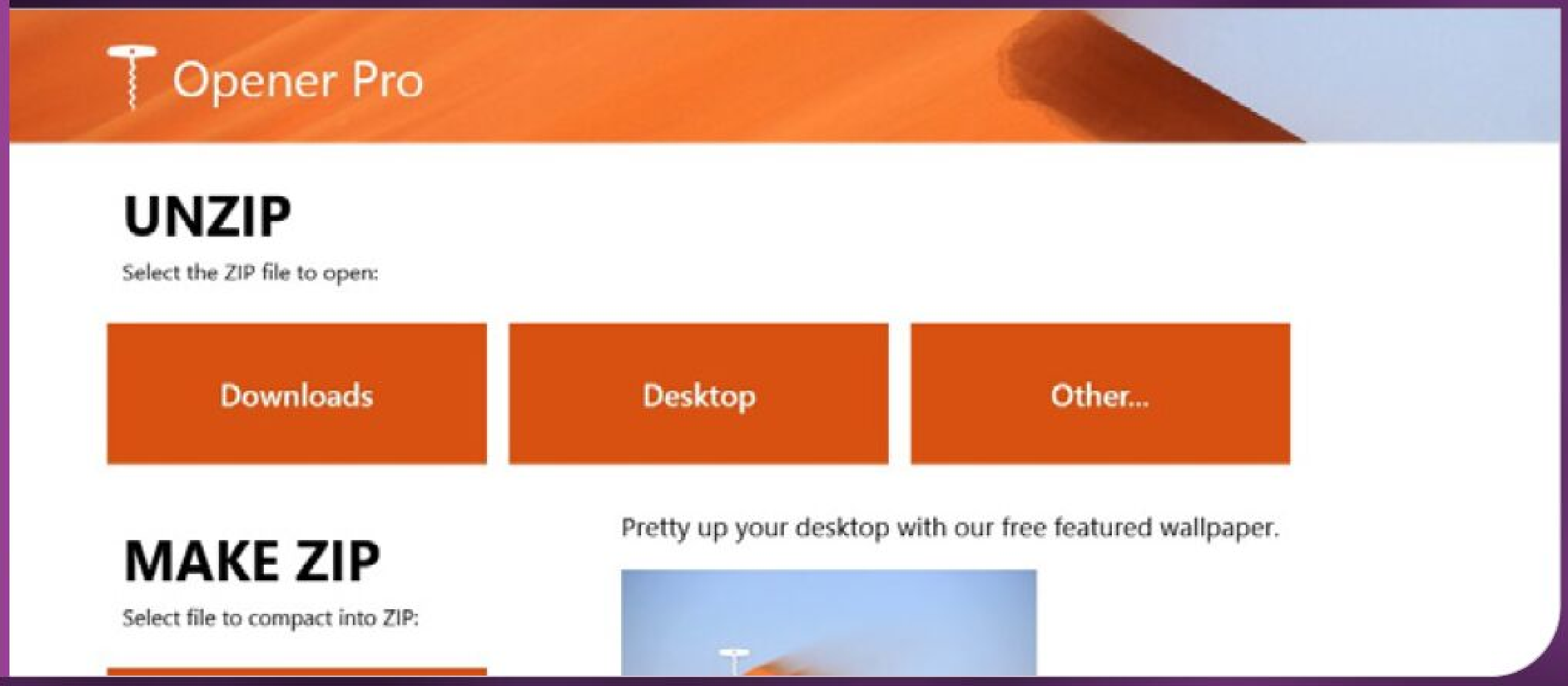
If you often struggle with having too many photos, videos or music on your PC, then Plex is for you. It's a complete media organiser that also enables you to access your media on different devices. You can also play all your media through the app. Plex apps exist for many phones and tablets including iOS, Android and Windows Phone devices.


PLEX
Libraries ›
Home Videos
Movies
Music
Photos
TV Shows
On Deck ›
Gravity
Inception
The Avengers
Archer (2009) S2 · E1
Playlists ›
Marvel Movies
Pop

OPENER PRO

Price: Free

Open ZIP & RAR files in seconds and create archives with a single tap. This is the Rolls Royce of file utilities, with a simple interface that gets things done in a flash. Opener Pro was built as a no compromise solution for those who care what they put on their computers. Small in size and efficient in operation, Opener Pro does not clog up your PC.

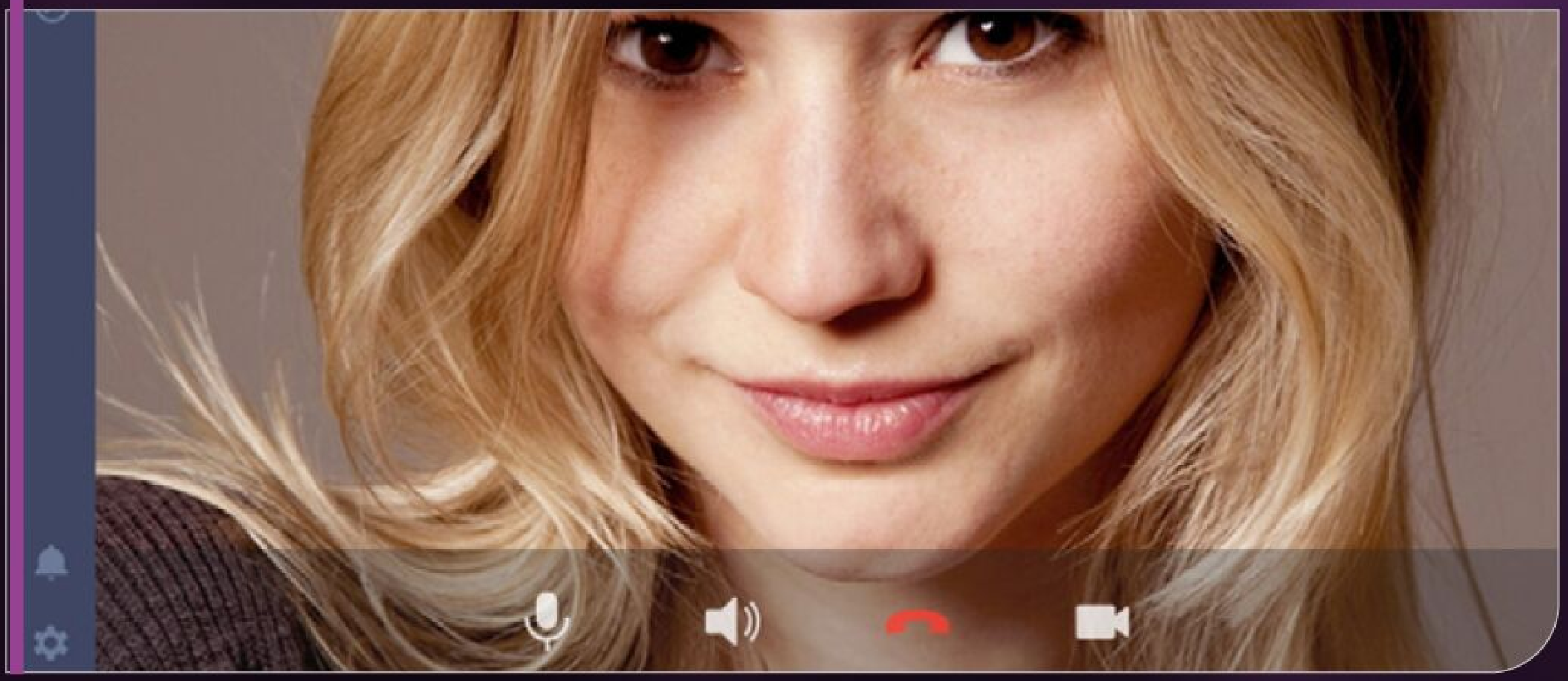

Opener Pro
UNZIP
Select the ZIP file to open:
Downloads
Desktop
Other...
MAKE ZIP
Select file to compact into ZIP:

Pretty up your desktop with our free featured wallpaper.

LINE

Price: Free

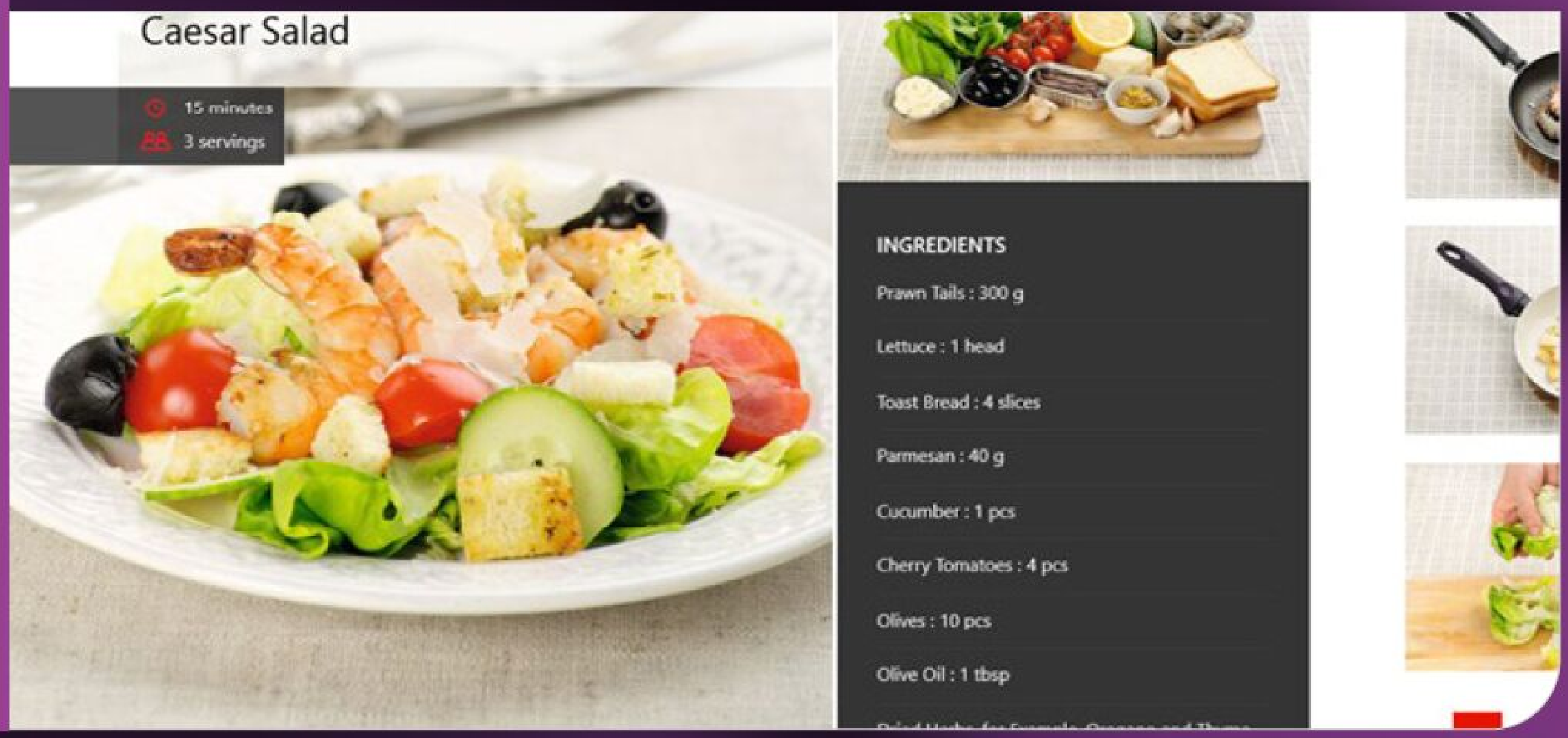
LINE reshapes communication, bringing you closer to your family, friends and loved ones for free. With voice and video calls, messages and a variety of stickers, you will be able to express yourself in ways that you never thought possible. With over 600 million users worldwide, LINE's constantly expanding platform will continue to provide exciting new experiences.



YUM YUM

Price: Free

An app that puts over 1,000 recipes at your disposal, Yum-Yum is a chef's delight. We think the best thing about it is that you are able to search by ingredient, so you can always find a recipe to suit. Then you can also choose recipes by difficulty, as well as cooking time, so you won't choose something that takes too long to make.



Caesar Salad

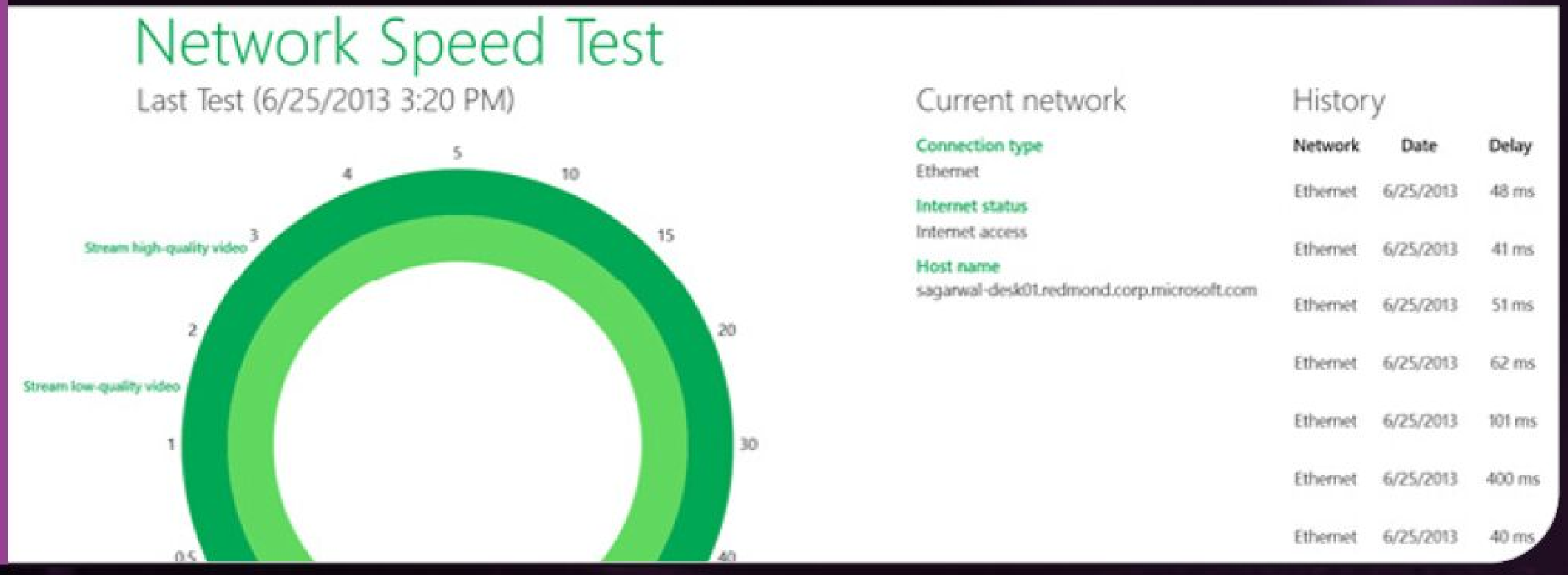
15 minutes
3 servings

INGREDIENTS
Prawn Tails : 300 g
Lettuce : 1 head
Toast Bread : 4 slices
Parmesan : 40 g
Cucumber : 1 pcs
Cherry Tomatoes : 4 pcs
Olives : 10 pcs
Olive Oil : 1 tbsp

NETWORK SPEED TEST

Price: Free

Network Speed Test measures your network delay, download speed and upload speed. Using servers all over the world, Network Speed Test measures your network connection's latency and throughput. Based on your connection's speed Network Speed Test will tell you what activities you might be able to do, such as stream music or make video calls.


Network Speed Test
0.5
1
2
3
4
5
10
15
20
30
40
Stream high-quality video
Stream low-quality video

Last Test (6/25/2013 3:20 PM)

Current network

Connection type
Ethernet

Internet status
Internet access

Host name
sagarwal-desk01.redmond.corp.microsoft.com

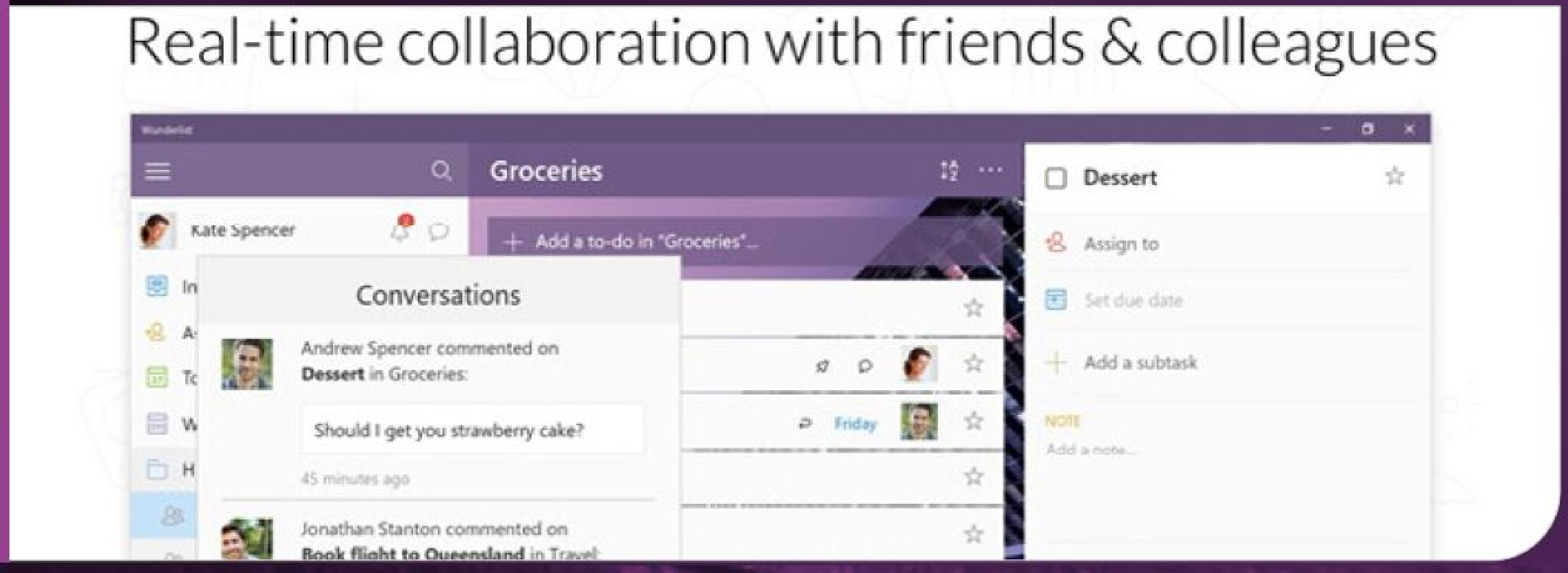
History

Network	Date	Delay
Ethernet	6/25/2013	48 ms
Ethernet	6/25/2013	41 ms
Ethernet	6/25/2013	51 ms
Ethernet	6/25/2013	62 ms
Ethernet	6/25/2013	101 ms
Ethernet	6/25/2013	400 ms
Ethernet	6/25/2013	40 ms

WUNDERLIST

Price: Free

Recently acquired by Microsoft, Wunderlist is a free productivity app that can be used to store ideas, make lists (as the name suggests), plan holidays, develop projects and more. You can easily share lists and notes with others, allowing you to use it as a collaborative tool and even sync it from your PC to your phone or tablet with the mobile version of the app.


Real-time collaboration with friends & colleagues
Groceries
Kate Spencer
Add a to-do in "Groceries"...
Conversations
Friday
Dessert
Assign to
Set due date
Add a subtask
NOTE
Add a note...

Andrew Spencer commented on **Dessert** in Groceries:

Should I get you strawberry cake?

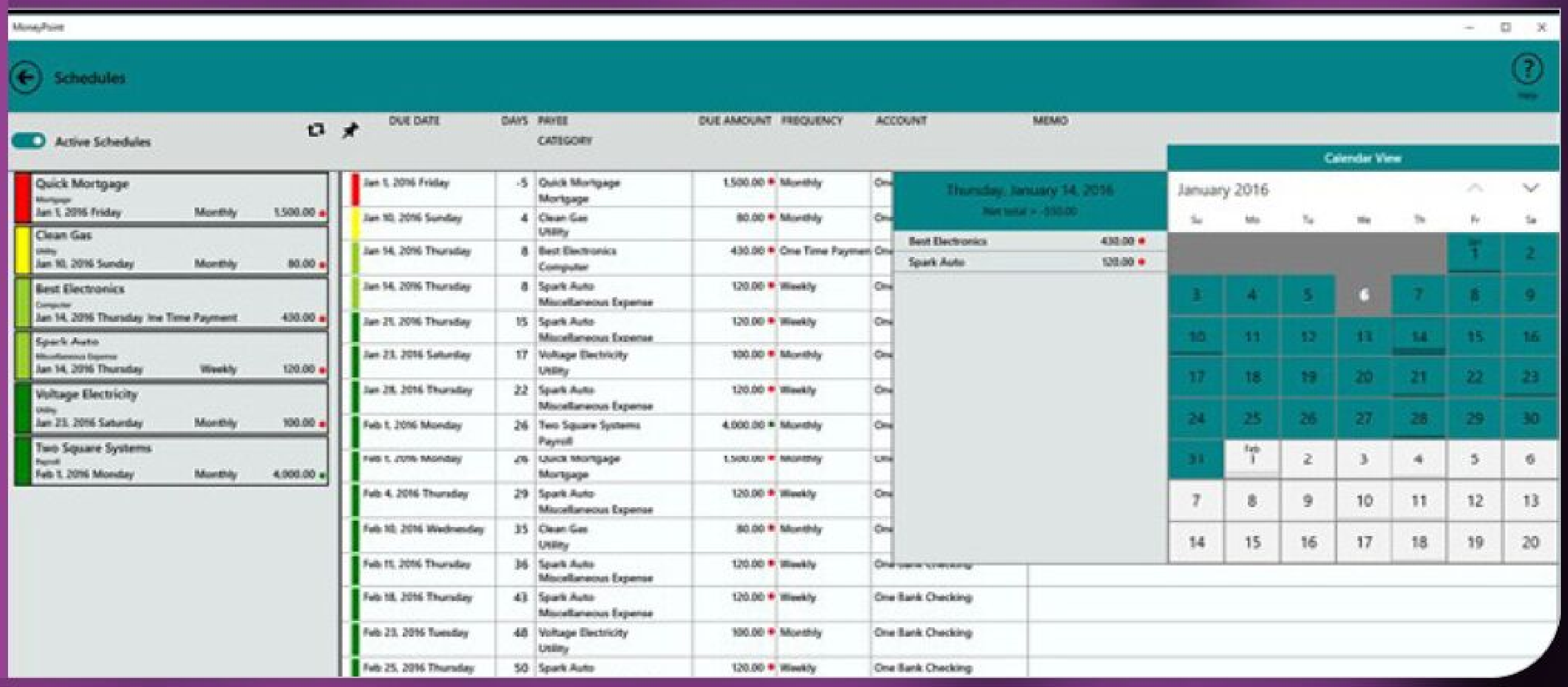
45 minutes ago

Jonathan Stanton commented on **Book flight to Queensland** in Travel:

MONEYPOINT

Price: Free

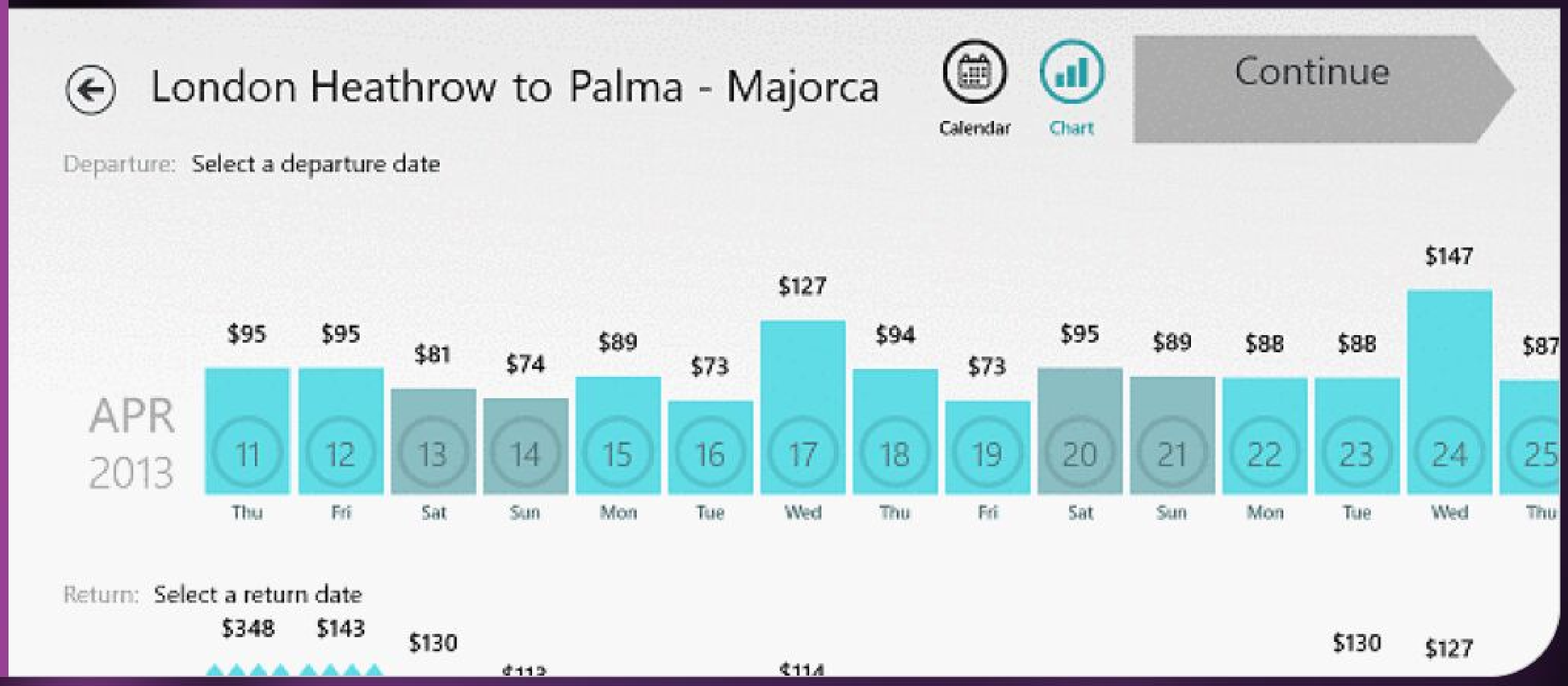
An impressive finance app for home or simple work accounts, MoneyPoint enables you to add your accounts, log transactions, allocate payees and categorise each item as well. You are also able to import Excel or CSV files into the app and even set up a password if you don't want any other people on your user account to see your finances.


Schedules
Active Schedules
Calendar View
January 2016

SKYSCANNER

Price: Free

Search millions of routes on over 1,000 airlines and find the lowest priced flights in seconds with the free Skyscanner Windows app. Skyscanner sources the best deals, then connects you to the airline or travel agent to make your booking directly, so you always get the best deals. It's simple, independent and finds the lowest fares fast.


London Heathrow to Palma - Majorca

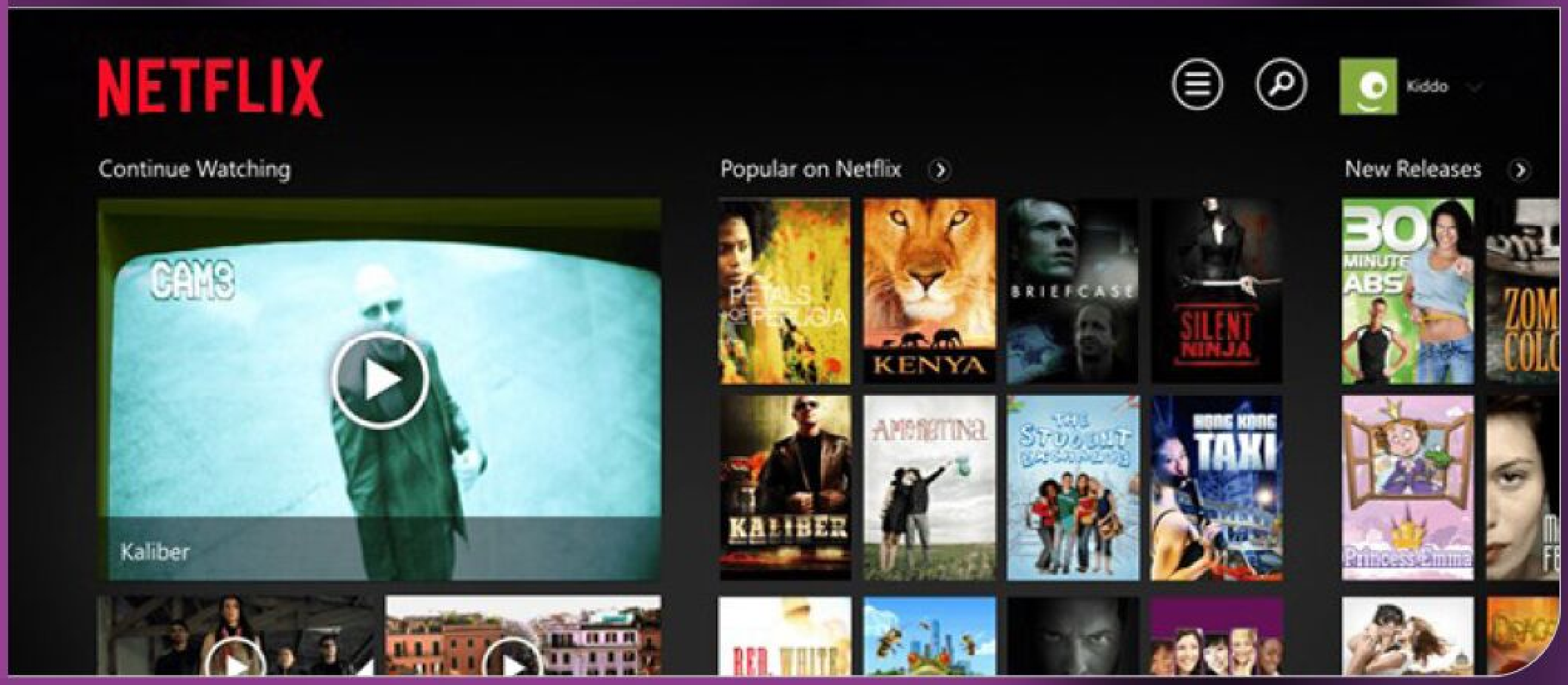
Departure: Select a departure date

Return: Select a return date
Calendar
Chart
Continue
APR
2013
$95
$95
$81
$74
$89
$73
$127
$94
$73
$95
$89
$88
$88
$147
$87
11 Thu
12 Fri
13 Sat
14 Sun
15 Mon
16 Tue
17 Wed
18 Thu
19 Fri
20 Sat
21 Sun
22 Mon
23 Tue
24 Wed
25 Thu
$348
$143
$130
$130
$127

NETFLIX

Price: Free (subscription required)

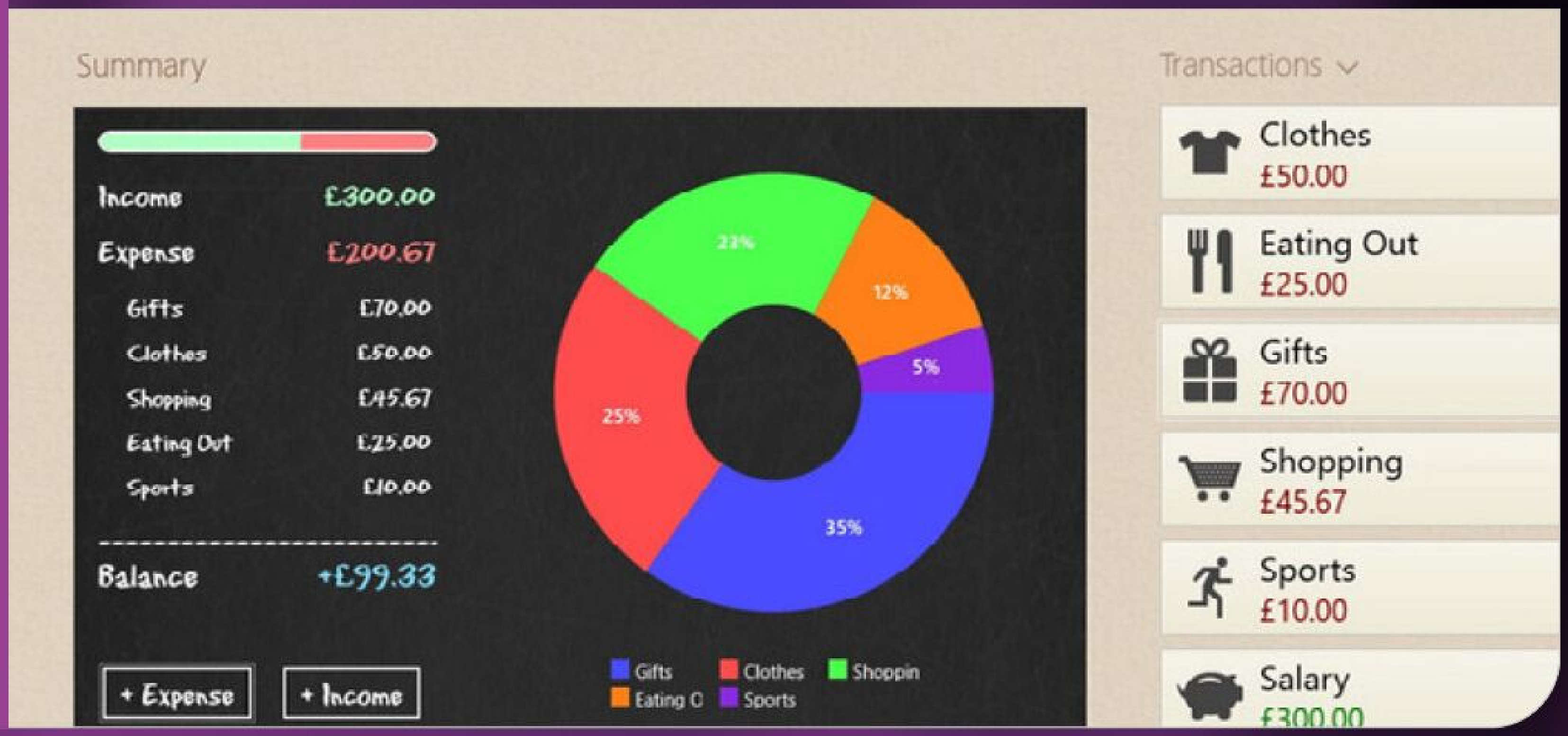
The ever-popular streaming video service now has a Universal Windows app for phone, tablet and PC, allowing you to watch Breaking Bad, Orange is the New Black and all the rest, whichever device you are using. The benefit of the the app over just watching through the browser is that the app remembers where you last left off watching and shows your List of movies and TV shows.


NETFLIX
Kiddo
Continue Watching
Popular on Netflix
New Releases
Kaliber

SPENDING TRACKER

Price: Free

Spending Tracker is one of the easiest and most user friendly Personal Finance Apps in the Windows store, and best of all, it's free. The simple fact is, by tracking your spending you will be able to stick to a budget and hopefully save money. So give it a try and have instant control over your spending.


Summary

Income	£300.00
Expense	£200.67
Gifts	£70.00
Clothes	£50.00
Shopping	£45.67
Eating Out	£25.00
Sports	£10.00
Balance	+£99.33

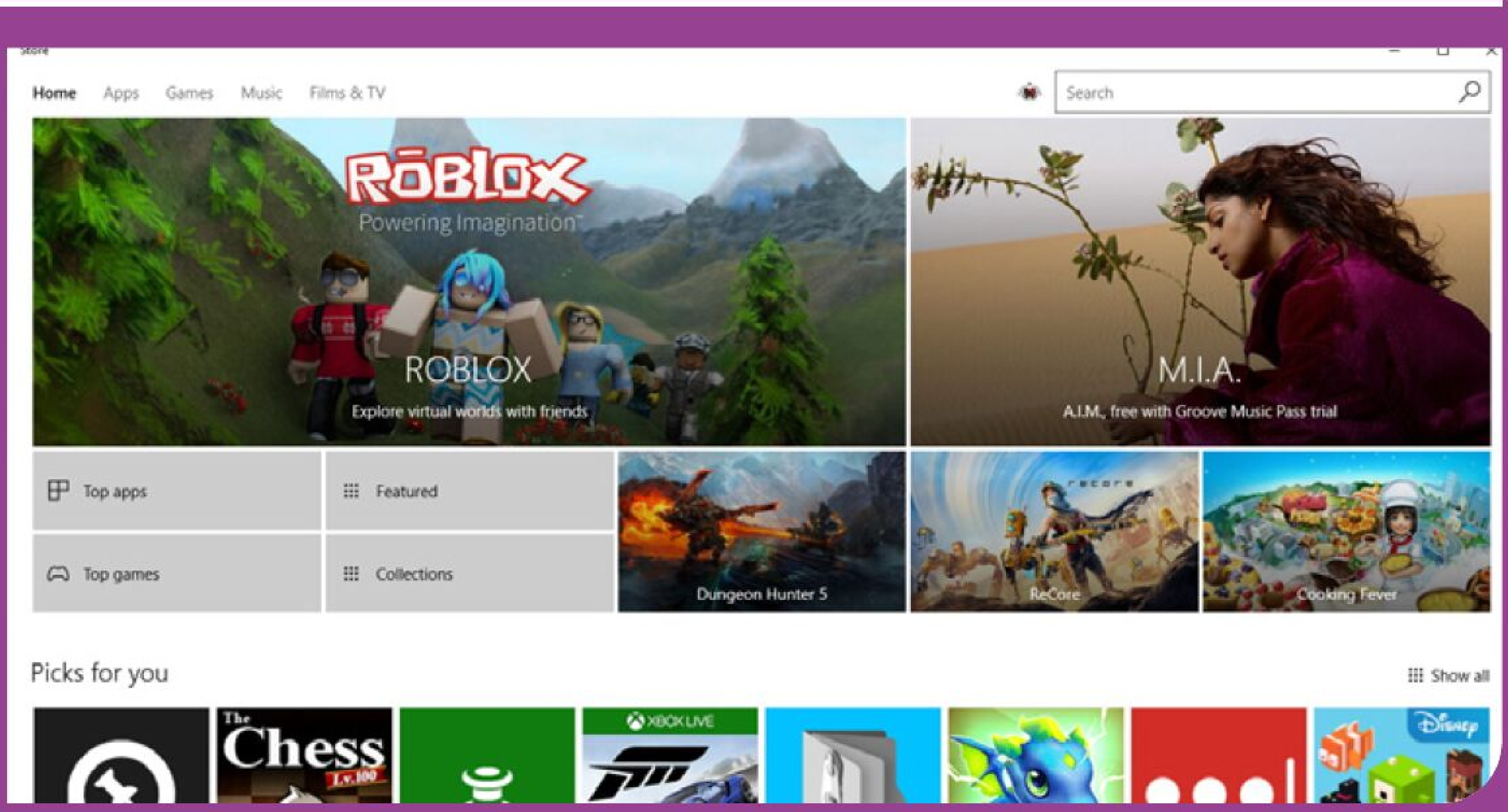
Transactions

Clothes	£50.00
Eating Out	£25.00
Gifts	£70.00
Shopping	£45.67
Sports	£10.00
Salary	£300.00

+ Expense
+ Income
23%
12%
5%
25%
35%
Gifts
Clothes
Shoppin
Eating O
Sports

THE MICROSOFT STORE |

Microsoft have made it very easy to find apps for Windows 10, and older versions, in the Microsoft App Store and this is usually the best place to look for Universal apps for Windows. You can still install software on your PC in the standard way, e.g. using a bundled installer or simply running the software by clicking the .exe file. The number of apps in the Microsoft store is growing daily but don't be afraid to look elsewhere.


Home
Apps
Games
Music
Films & TV
Search
ROBLOX
Powering Imagination
ROBLOX
Explore virtual worlds with friends
M.I.A.
A.I.M. free with Groove Music Pass trial
Top apps
Featured
Top games
Collections
Dungeon Hunter 5
ReCore
Cooking Fever
Picks for you
Show all

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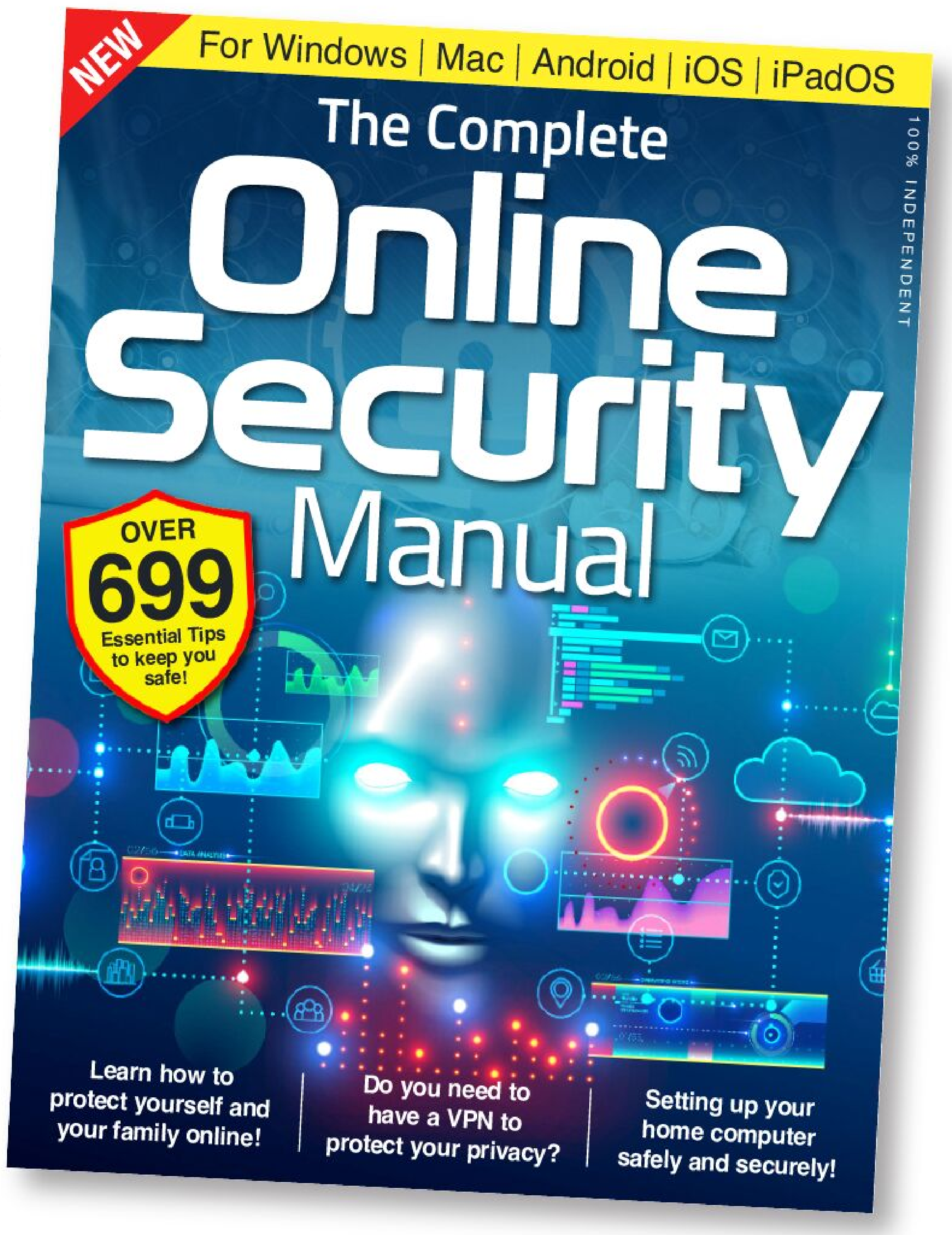
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